THE MODEL ENGINEER

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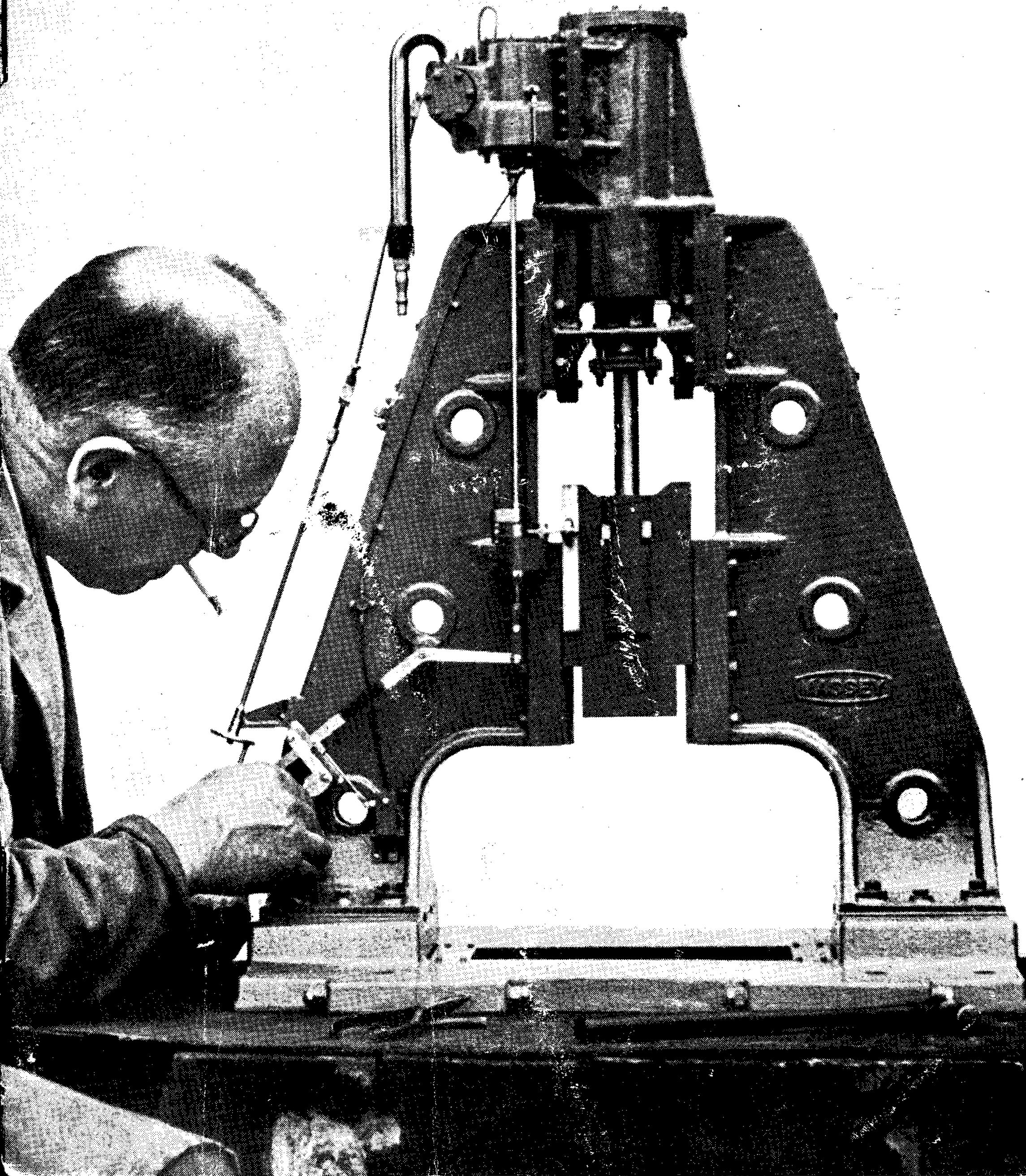


The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

3RD NOVEMBER, 1949 VOL. 101 NO. 2528

SMOKE RINGS

The Creative Urge

● A LEADER writer in one of the daily papers recently commented on the increasing interest which is being taken in sketching, painting, and other forms of art. Since the war, it is stated, people have taken to these pursuits in tens of thousands, and the reason suggested for this is that after an upheaval in the normal affairs of life, people often turn to creative art as an escape from mundane problems and personal troubles. "People like to think they are creating something, however poor. It is the antithesis of the atom bomb." We are inclined to believe that the root cause lies even deeper than this; the urge to create is strong in every normal human being, but it is often stifled by the more obvious and prosaic needs of everyday life, such as making a living, building up a career or raising a family, which seem to take up one's whole time and attention. It is rather significant that some people never attempt to take up serious pursuit of an art or craft until they reach retiring age. We make no definite distinction between art or craft, because it is difficult to fix a dividing line—if, indeed, one actually exists—but it is a fact that many people who have no aspirations to "art" in the usually accepted sense are quite capable of acquiring a competence in various kinds of craftsmanship, and using it to satisfy the creative urge. The model engineer who reproduces in miniature a historic engine or ship, or an experimental model to demonstrate an original idea, may create as worthy a masterpiece as the most highly gifted artist or sculptor; and though few may ever realise it, everyone who works at the lathe or bench to shape raw material into the concrete realisation of a dream or idea, is adding his modest brick to the edifice of science or culture. Many of the craftsmen of the past have "builded better than they knew," and though their names may be forgotten, their work has been bequeathed to posterity as a monument to them and an inspiration to those that follow on. Fashions in art may change, but the craftsman's work, in any age or realm, can never fail to arouse interest and admiration.

Pageant of Youth Exhibition

● WE HAVE been informed that a Pageant of Youth Exhibition will be held at Bingley Hall, Birmingham, from June 17th until July 1st, 1950. There will be two main divisions; first, Youth at Work, with exhibits showing the wide variety of careers open to young men and women today. Secondly, Youth at Leisure, covering sport, hobbies, models and youth organisations. This second division will also include a special section for the Junior Miss, with fashion parades, beauty aids and home training exhibits. It is intended to make special arrangements for parties of visitors from youth organisations and schools throughout the Midlands. Further information will be obtainable from J. P. Good (Exhibitions) Ltd., 3, Cotford Parade, Thornton Heath, Surrey.

The "M.E." Index

● OUR CORRESPONDENCE files indicate that many of our readers cannot understand why we still have to ask those requiring an index to forward their request accompanied by a stamped addressed envelope of suitable size. They consider than an index for the immediate past complete volume should be provided to all purchasers of "Ours." In principle, we fully agree; but we feel that we must remind our readers that paper rationing is still in force. We are permitted to consume only a stated amount of paper in any rationing period, and the paper so consumed must cover not only THE MODEL ENGINEER itself but any incidental items such as loose sheets or folders published with the journal. Readers will appreciate that, since the demand has shown a very considerable increase in recent months, and is still rising, to print an equivalent number of copies of the index unless they are definitely required by all readers would make unnecessary inroads in our paper stocks.

We look forward to the day when the raising of restrictions will give us greater freedom of action in these and allied matters.

Model Yacht Building Classes

● WE UNDERSTAND that the arrangement between the Barrow Education Committee and the Barrow Model Yacht Club, by which the committee sponsors classes in model yacht building as part of its further education syllabus while the club supplies the drawings and some of the tools, is working well. A recent exhibition arranged by the club gave proof that those who are attending the class are keen on the work in hand, and the experience of the new idea bodes well for the future.

No other town is known to have such a class as that existing in Barrow during the winter months, and there is no doubt that the model yacht builders owe much to Mr. H. G. Coade and Mr. E. Eales, the former of whom is a club vice-president and has provided a new design this year, while the latter is the club's chairman and a class instructor. In encouraging such activities as the model yacht class, the Education Committee has taken a bold, but proper step, fully justified by the success achieved.

What is the Use of it All?

● AT AN exhibition of model engineering, arts and crafts in the provinces not long ago, we could not help overhearing some conversation between two young men and a young woman. One of the young men was obviously an enthusiast; at any rate, he was talking knowledgably about some models close by and was pointing out some of the chief features of a particular exhibit which, incidentally, was a very fine piece of work. The other young man seemed to be interested, up to a point, but we gained the impression that he was not technically-minded, and was certainly not a model engineer. This little party had evidently been round the show and were on their way out of the hall when we encountered them. Just as they set off in the direction of the exit, the young woman exclaimed: "Yes, it really is a fine show, and I had no idea that anything like it was possible in this town. But what is the *use* of it all?"

Our silent sympathy went out to the first-mentioned young man, and we would like to have heard what he replied; but all three of them had arrived in the street by that time, leaving us wondering what was subsequently said.

That young woman's question is one that has often been put to us, in years gone by; until this particular occasion, we had not heard it for years, which seems to suggest that people who can see no use for a hobby are diminishing in number. Or is it that more people are taking up hobbies? However, there can be only *one* "use of it all," and it is that a hobby of any kind provides a change from a professional routine, or a relief from a daily round; and that, in itself, is a good thing, because it helps to keep one's faculties alert, discourages laziness and has a tonic effect on the mind.

From Australia

● A FORMER Brighton reader who is now resident in Australia, where he has been for about six months, has sent us an interesting letter recounting some of his impressions as a model engineer. He writes:

"It is quite true that the model-making fraternity are the same cheery and helpful crowd the world over. I have joined the Melbourne Society, and find that the similarity of the general conversation to that at the Brighton Society, or any place where model engineers meet, is uncanny. Here, they want to know, with bated breath, if I have seen "L.B.S.C.'s" Polar Route, and what is Austen-Walton's *Centaur* really like.

"If you should get any enquiries for advice *re* bringing out the contents of workshops over here when emigrating, my suggestion, for what it is worth, is 'take everything you can pack.' I am setting up a garden workshop here. There is usually quite a lot of space available, and instead of thinking in terms of 6 ft. by 8 ft., or less, it is 12 ft. by 10 ft., or more.

"My new Drummond-Myford $3\frac{1}{2}$-in. lathe has been much admired here, and everybody is agreed that there is no native product to compare with it.

"There are some fine models made and being made here, but most of the makers seem to suffer from an inferiority complex and imagine that their work is not as good as that produced 'back home.' This is a totally false idea, I assure you."

We feel that these impressions may interest many readers, and in thanking our correspondent for them, we express the hope that he will be able to persuade his new friends to send us photographs and descriptions of their work. We know that model engineering is popular in Australia, and we also know that, in that country, enthusiasts have often to practise their hobby in difficulties which are not met with in Britain, even in these austere times. But this adds interest to the work which is produced in Australia, and helps to strengthen fellow-feeling between the two countries. So, we hope that our *ex*-Brighton friend may serve as a useful contact between our Australian readers and ourselves.

A Model Arch-Form Hammer

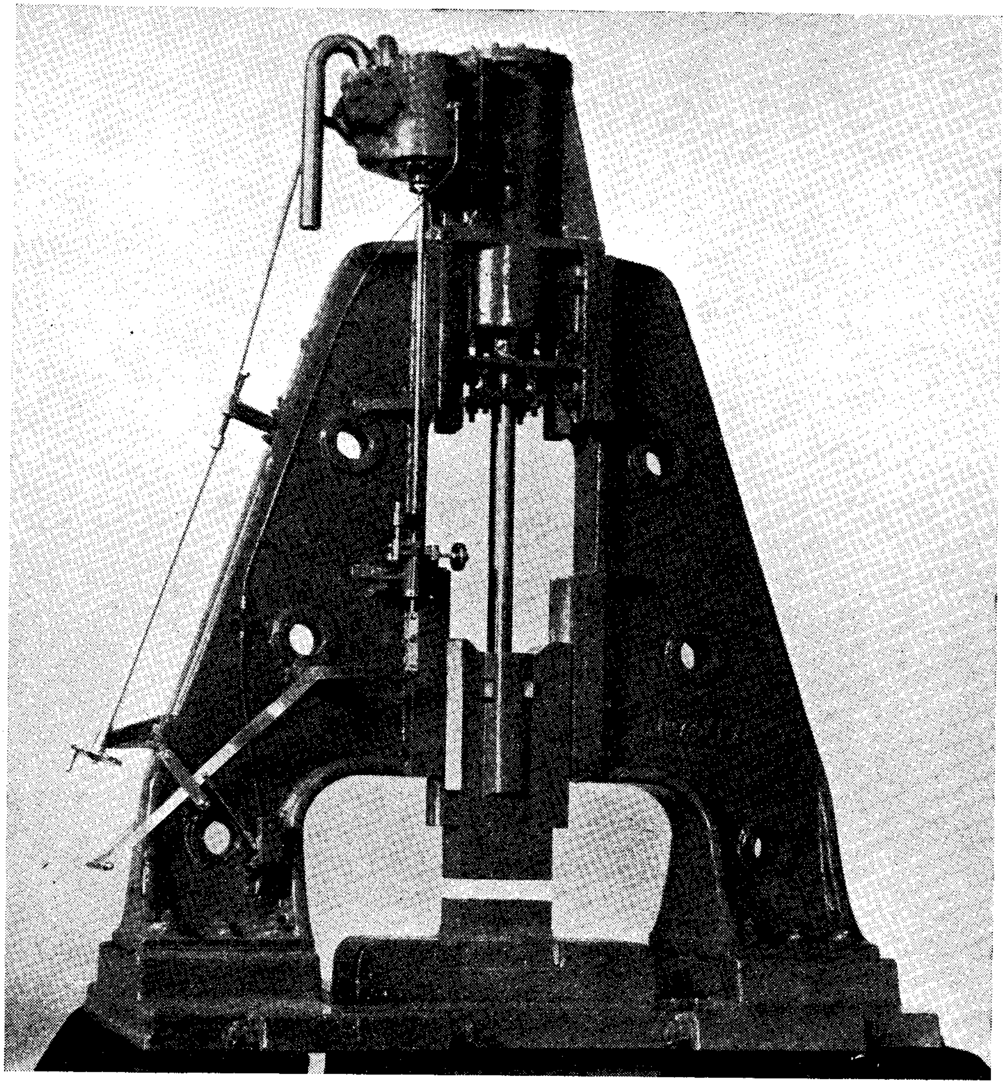
by R. Alderson

THE photographs which accompany this article are of a working model to a scale of $1\frac{1}{2}$ in. to 1 ft., of a "Massey" 60-cwt. arch-form hammer, made in the writer's home workshop for the last Machine Tool Trades Exhibition, where it was used to demonstrate the functioning and proportions of the full-size machine.

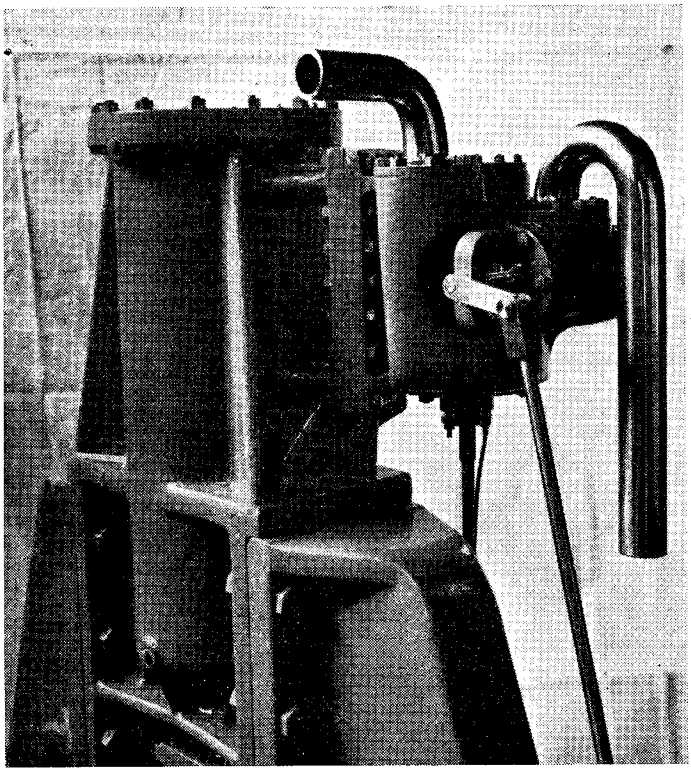
All the machining, with the exception of the plain surfaces on the standards, baseplates and anvil block, was carried out on a 5-in. "Atlas" lathe and a $\frac{1}{2}$-in. "Pacera" pillar drilling machine.

The cylinder, valve chest, standards and baseplates are castings, all other parts were machined from the solid.

The overall dimensions of the cylinder casting were 11 in. $\times$ $5\frac{3}{8}$ in. $\times$ $4\frac{1}{4}$ in. with a bore $2\frac{5}{8}$ in.



The assembled model without foundations



Showing the cylinder, valve chest and stop-valve from the rear

diameter by $7\frac{3}{4}$ in. long and the tup was machined from a lump of forged steel 4 in. × 3 in. × 6 in. These dimensions give an idea of the size of the pieces, which are very near to the limit possible on a 5-in. "Atlas" lathe.

The methods adopted were those so frequently and competently described and illustrated by the regular writers in THE MODEL ENGINEER. In fact, old copies were frequently reviewed for inspiration in solving problems of ways and means of tackling a job at home, which would have been quite straightforward in a fully-equipped workshop.

To an engineer very familiar with modern equipment and methods, the limitations of equipment available gave an added interest and spice to the job, and additional satisfaction in the result, which was well up to standard.

The arch hammer which the model illustrates, can be driven by steam or compressed air.

The fundamental basis underlying the size or power of the blow, is that the energy contained in a moving body, is equal to the product of the mass and the velocity, and the force necessary to bring the body to rest is in inverse proportion to the time taken. In other words, for any given velocity the more rapidly the moving parts are brought to rest, the greater the blow. The elasticity of the moving parts, the frame and anvil block, and the give of the work under the hammer, all come into action when the blow takes place, which makes it impossible, for all practicable purposes, to measure the time taken to bring the parts to rest, and, therefore, to state the size of blow a hammer will give.

It is customary to describe the size of a hammer as the weight of the moving parts, and not by the size of the blow it will give. To ask the weight of the blow, is to ask something which cannot be stated in terms of weight.

Some idea of the forces at work have been ascertained by comparing the effect of a hammer blow from a small hammer, on a test piece of known dimensions, with the load required to produce the same effect under compression in a testing machine. One such test showed that a 5-cwt. steam hammer with a moderate steam pressure gave a crushing effect equal to that produced by a load of 30 tons.

An interesting and impressive demonstration of how energy can be converted into heat, is easily carried out by hammering a piece of cold mild-steel about $\frac{7}{8}$ in. square under a quick-acting 5- or 7-cwt. hammer. The steel is soon brought to white heat. (Of course, it does not do the steel any good.)

The construction of a large arch hammer can be seen by reference to the photographs of the model, which is true to scale.

The valve chest contains a stop-valve and tube, and a piston-valve and tube ; it is jointed to the cylinder with fitted bolts, and rests on brackets to support it against shock stresses.

The cylinder rests on top of the two standards, and is bolted between them by fitted bolts.

The standards, which are box-form castings, are bolted and dowelled to the baseplates, and stand in grooves designed to prevent side movement or twist.

The baseplates are bolted by long bolts to the concrete foundation. Two tie plates are tongued and grooved and bolted to the inner edges of the baseplates to space them. The top of the tie plates is at floor level, and a clear space is left between them for the top of the anvil block.

The piston and rod is in one piece and has a ball end which goes into a recess in the tup.

The tup is made from cast steel. It is recessed to hold an arrangement of spherical washers to fit the ball-end of the piston-rod, and these are secured in position by two large cottars.

The steel tup slides have double vees to guide the tup. They rest in grooves in the standards, and are secured with fitted bolts.

The pallets are of high carbon-steel with

hardened faces. One is dovetailed and keyed to the tup, and the other to the anvil block.

The anvil block is a solid casting of special cast-iron or steel, and its weight is usually about ten times that of the moving parts.

The baseplates and the anvil block, stand on baulks of timber resting on a massive concrete foundation. The anvil block is held in position by pieces of timber inserted between it and its recess in the concrete foundation.

It will be appreciated that if the valve was a simple piston-valve, as used in a steam engine, the piston would be driven through the cylinder-head with the same force as it is driven down to make the blow.

In the model and in the full-size hammer, there is a shaped track machined on the front of the tup, which engages with a roller on the end of a spring-loaded lever system, arranged to turn the piston-valve on its axis, whilst leaving the vertical up and down movement of the valve under the control of the hand-lever.

If the hand-lever is pulled up, the tup rises, and if pushed down, the tup goes down, the automatic turning movement of the valve providing a cut-off.

The valve tube and the valve have a system of ports of different shapes and sizes, so that on the down stroke anything from a small to a large opening of steam to the top of the piston is available, according to the position of the hand-lever, with a free opening to exhaust from the underside of the piston. The cut-off takes effect on the steam side only.

On the up stroke the openings to steam are somewhat similar, but cut-off takes effect by restricting the steam inlet to the underside of the piston, and to the exhaust from the top side of the piston.

The weight of the valve and its spindle is carefully balanced, so that the movement of the hand-lever is light and free, and the valve setting is such that the tup responds accurately and without hesitation, to every movement of the hand-lever.

The port in the top of the cylinder, is below the cylinder cover by several inches, so that if the piston rises very quickly, it passes over the port and cushions on the steam trapped above the port.

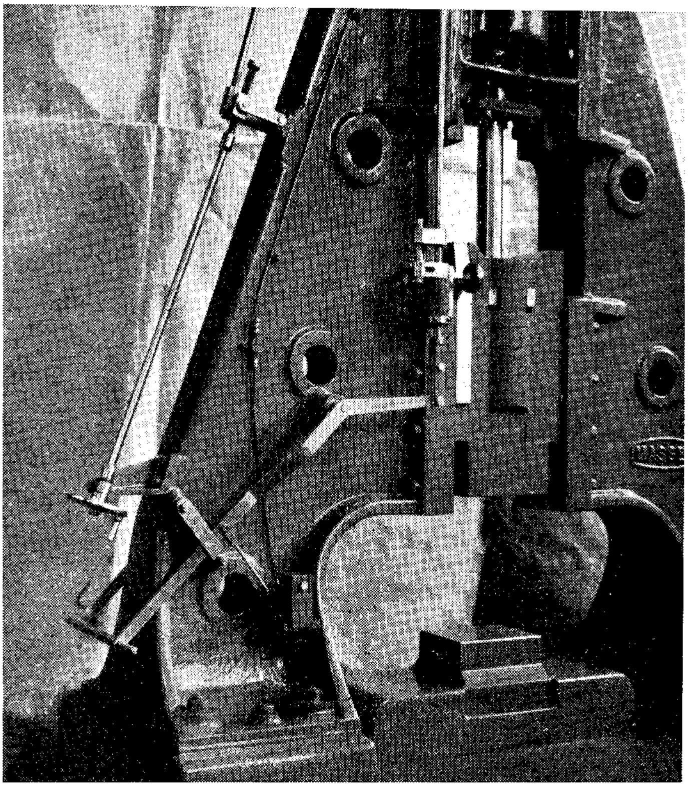
Two blocks of timber are bolted to the standards under the cylinder, to provide an extra safeguard against any failure of the normal buffering arrangements which might occur through excessive wear or a blown joint, and to provide a stop if the hammer is left in the hold-up position.

An automatic lubricator is connected to the hand-lever to oil the valves and cylinder.

The design and workmanship of these large hammers has to be of a high order. The parts have to resist severe shock stresses, and they must not shake loose. The valves and tubes are carefully ground to size and must be accurately set.

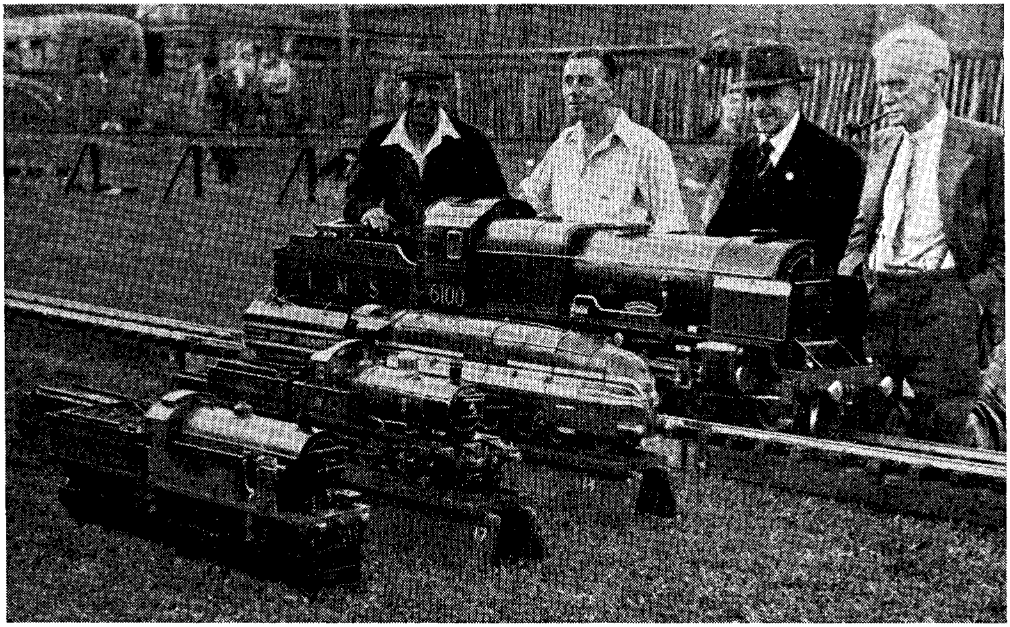
Despite their size, weight and power, these hammers must be able to repeat, on a gargantuan scale, all the variations of blow which can be obtained by a hand hammer in the hand of a skilful smith, from light blows, to full power blows, all either quick or slow, dead or rebounding, the variations being available as quickly as with a hand-hammer. In addition, they must be able to press down on to the work, and to hold up away from the work.

[Apart from its virtues as an excellent piece of model engineering, and an efficient working model, this hammer is of outstanding interest in pointing out the possibilities of the less commonly known engines and machines as subjects for modelling. In our issue of October 27th, a contributor made some suggestions for "different" models—well, here is something definitely off the beaten track and well worthy of serious consideration by those readers who seek an escape from conventional types of models.—Ed., "M.E."]



A close-up of the controls and valve-gear

Locomotive Trials at Andover



Locomotives and their builders at Andover. From left to right: Mr. C. Barnett, $7\frac{1}{4}$*-in. gauge "Royal Scot"; Mr. W. Moody,* $3\frac{1}{2}$*-in. gauge streamlined* 4-6-2 *engine ; Mr. W. Cannon,* $3\frac{1}{2}$*-in. gauge free-lance* 2-6-0*, and Mr. F. Westlake,* $3\frac{1}{2}$*-in. gauge S.R.* 4-4-0

SUNDAY, September 11th last marked one of those pleasing occasions when clubs get together for mutual assistance and, at the same time, enjoy a social event. On that date, the Andover Model Engineering Society were hosts to the Basingstoke, Southampton and Newbury clubs and some visitors from Winchester. The hosts' $3\frac{1}{2}$-in. gauge track was available to Basingstoke and Southampton for the trial runs of two new engines.

Mr. Westlake, of Basingstoke, took the road first with his 4-4-0 Southern "D.15," an engine which, although not correct in every detail, is typical of a craftsman's work. Her first run showed that, when she has been properly run-in, she will be a useful addition to the Basingstoke stud. The free-lance feed-pump did not function, owing to the steam valve seizing up, which did not allow full justice to be accredited to the model's performance ; but, after all, what are trials for ? Mr. Westlake can certainly be congratulated upon a fine piece of work.

Mr. Cannons, of Southampton, came next with his free-lance 2-6-0 locomotive which put up a very creditable performance. The absence of cylinder cocks, however, made her rather unpopular at times, and she eventually retired to rest, amid promises of modification !

Then came Mr. Moody with his streamlined 4-6-2 engine *Tremona Court*. This is an engine which can almost be termed a veteran, so she performed without any trouble at all. She won many admirers, some technical and some sentimental, for Mr. Moody is noted for his very high standard of workmanship.

Mr. Barnett's $7\frac{1}{4}$-in. gauge "Royal Scot" spent a trouble-free afternoon on her own track, hauling all and sundry. She, too, had many admirers who kept Mr. Barnett busy answering their many questions.

We are indebted to Mr. R. Pemble, hon. secretary of the Andover society, for the foregoing particulars ; but he adds : "What of Newbury and our friends from Winchester?" There are three $3\frac{1}{2}$-in. gauge locomotives in course of construction at Newbury, while at Winchester they have yet to form a society ; but none the less, they were keenly interested in our gathering. There is no doubt that Andover has started something in Hampshire."

The "Civil Engineer's Department"

by "L.B.S.C."

As followers of these notes send in queries, from time to time, relating to the construction and maintenance of their small railways, maybe a short lobby chat about my own experiences, might be of some little interest. For beginners' and new readers' benefit, I might repeat that my "main line" consists of a 250-ft. multiple-gauge continuous run, slightly egg-shaped, owing to the boundary of the bit of ground which lies between our hacienda and the bank carrying the main line of what was once the London, Brighton and South Coast Railway, on the engines of which, in happy days gone by, I earned my daily bread. The north curve is 21 ft. radius, and the south curve 17 ft. 6 in. radius, with fairly long straight lengths between. Both curves have entering transition curves; that is, you don't barge slap-bang into the full radius from the straight run, but the actual point where the curve begins, is very nearly imperceptible. The curve gradually sharpens up until the full radius is attained. As we only run one way, the change from curve to straight is not graduated. there being no need for it; anyway, I haven't found any. A locomotive travelling at a good speed, needs gradually "easing off" from straight to curve, to avoid running off the road, but she swings into the straight again, quite comfortably, at the maximum speed that the curve will allow. A sudden swerve at the entry, is also liable to throw unwary passengers off the cars, but there is no "like effect" at the exit end. Also, the transitions reduce railhead and flange wear.

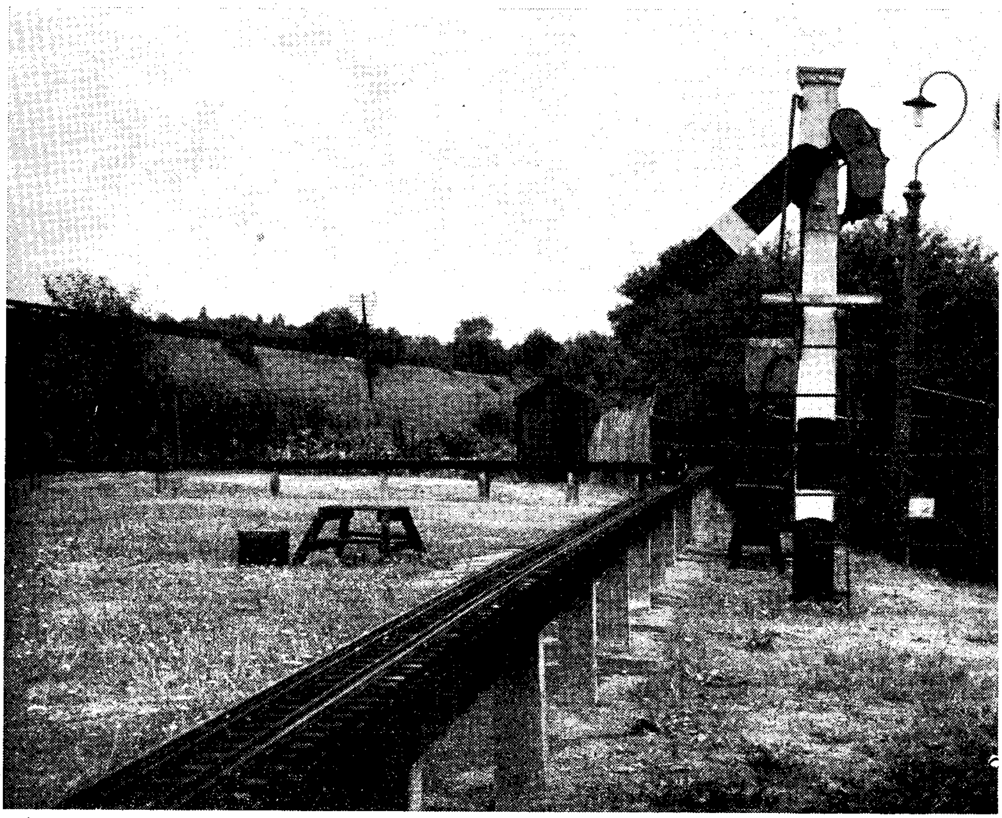


Photo by] [*L. J. Hibbert*

"Down" straight and south curve — a light engine has just passed signal

A Good Start and a Solid Foundation

As older readers may remember, the ground was levelled up, the route surveyed and set out, and the concrete posts "planted" by the full-size permanent-way gang who looked after the adjoining length of what had then become the central section of the Southern Railway; so my

little line had an auspicious kick off! They were intensely interested in the job, and spent two hours per evening for a fortnight, getting it just right; this took place in the early fall of 1936. Such things as ration books were unknown in those gone-but-not-forgotten days, consequently my fair lady looked after their material needs, supplying them with tea and home-made cakes *ad lib* whilst the work was in progress. *And* there was no "go-slow" about the job, either. As there was a difference of several feet in the ground level between the east and west sides, they dug out the earth from the high side, and transferred it to the low side, thus forming a level "plateau." I had no wheelbarrow at the time, and the evening they started operations, the ganger went up to the station and telephoned the depot. Three wheelbarrows came down on the next train! The ganger and his "sub" set up two "totem poles" at the centre of the curves, and by aid of a steel tape, located all the posts at the correct radius. The posts were made specially to my order, by the same firm who made the posts carrying the cable troughs on top of the railway bank; there are just fifty of them, and they go about 2 ft. into the ground. The "boys" made a thorough job of it, digging big holes and well punning the earth down at the bottom, to give the bases of the posts a firm support. They have not sunk to any appreciable extent in 13 years, except at one point, which was no fault of the gang's. In passing, I might mention that, alas! only two of the original gang are now left, illness, *Anno Domini*, and Jerry accounting for the other six; incidentally the two survivors erected the old Coulsdon signal post $2\frac{1}{2}$ years ago. It is solid pitch pine, and I couldn't lift one end of it.

Permanent Way

The 4 in. × 2 in. longitudinals were supplied by a South London timber merchant, and are pressure-creosoted. They were erected during two week-ends by a couple of carpenters from the works of a friend at Southall. The ends of the longitudinals join on top of the posts wherever possible, and have a distance piece between at other places, coach bolts holding the lot together. The tops were planed level. I laid all the sleepers and rails, the latter being extruded brass alloy, and very hard. No. 4 brass round-head screws, and brass or copper washers to suit, hold the rails down. No fishplates are provided, an extra wide sleeper being placed under each joint. The sleepers are 6 in. long, $\frac{5}{8}$ in. thick and 1 in. wide, spaced $1\frac{1}{2}$ in. between, so there are a lot of them. I used about 50 gross of screws and washers, and if I had not had an automatic screwdriver for the job, I guess I'd still be putting them in! The outer rail on the straight runs, was set to a straight-edge; and on the curves, it was simply sprung to a chalk line on the sleepers, set out by tying the chalk to a cord, the other end of which was looped over the "totem pole." The other three rails were set by gauges, three of them, made by milling notches at the correct distance apart, in 4 in. lengths of $\frac{1}{2}$-in. square steel bar, giving gauges of $3\frac{1}{2}$ in., $2\frac{1}{2}$ in. and $1\frac{3}{4}$ in.

Maintenance

When erecting the longitudinals, the carpenters placed folding wedges between the underside of them, and the ledges on top of the concrete posts, the tongues of the latter going up between them. This allowed for any adjustment that might have been required through the effects of the variations in the British climate, or sinking of the posts. This adjustment, however, was never needed. What happened was, that the longitudinals began to warp and twist. I had to counteract that, by putting bits of packing under the ends of the sleepers, where necessary, and so managed to keep a level road. The only serious trouble was inadvertently caused by my next-door neighbour, who was at one time in the engineering dept. of the L.B. & S.C. Rly. and had become superintendent of the Urban District Council depot adjoining our houses. He put up a new fence at the bottom of his garden, and asked if he might dig away a little of the earth on my side, which was at a higher level, to prevent rotting of his bottom timbers. I said go right ahead, and he overdid it, going too close to the bottoms of four of my posts, so that they began to sag outwards, splitting open the joints in the longitudinals, and upsetting the transition curve at the south end.

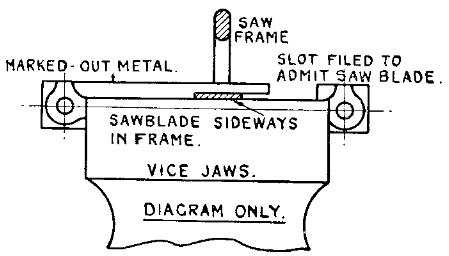
I replaced most of the earth when I saw what was happening, but the mischief was done, and that corner always needed attention. My few friends persistently ignored the necessary speed restriction, and there were plenty of derailments at that point. On top of that, the longitudinals at that particular spot, for some unexplained reason, began to rot, and became spongy, so that I had to put metal reinforcements underneath, and use a lot of extra sleepers, pending renewal when I could find time. As the joints in the rails naturally opened up as well, when the line sagged outwards, I knocked up the rails at each end of the bad place, leaving a big gap in the middle, and closed that by inserting an extra bit of rail.

Another trouble was loose screws. The original screws were $\frac{1}{2}$ in. long, and continually became loose, requiring frequent attention with a screwdriver. Many screws were replaced by $\frac{5}{8}$ in. and $\frac{3}{4}$ in. at points where the greatest stresses occurred, e.g. at the beginning of the curves. Anyway, to cut a long story short, by keeping a wary eye on the line, just like the ganger does in full size, I managed to maintain it in good working order; and my own engines, plus those of my few personal friends who had running powers over the line, covered many miles in comparative safety. The fact that the tops of the outer rails are always bright, like those of a full-size line, is evidence that the little railway carries plenty of traffic, as indeed it does, though most of the running is done in late evening, plus an occasional Saturday afternoon.

The Last Straw!

Owing to lack of that most important of all commodities, time, the replacement of the rotting longitudinals was continually put off, although they had begun to sag under heavy loads; but eventually there came a day when the last straw

broke the camel's back, in a manner of speaking, although I didn't discover the damage until the next time I wanted to run. As already recorded, "Susie M" and her genial owner and two friends, came to have a run one Saturday afternoon. Now "Susie" is a pretty hefty lass, but only has four wheels; also her owner isn't exactly a bag of feathers, and the special car which he uses when driving, also runs on four wheels only. This load, plus two passengers on one of my own cars, proved too concentrated for the "wonky" bit of line; and although nothing happened at the time, and I ran "Jeannie Deans" at high speed around it directly after "Susie" had finished running, something must have given way, as the next time I got up steam and went around at only a slow speed, doing a spot of injector testing, the line sagged alarmingly and threatened to collapse altogether. Probably the reason it did not go down when running "Jeannie Deans" directly after "Susie," was the speed at which I ran over it; and I recollected afterwards, that I did have one derailment on that curve, but attributed it at the time, to leaning forward too much when operating the injector. I expect our friends will remember the incident.

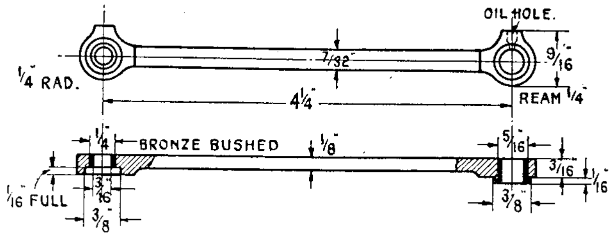


Cutting out coupling-rods by hand

When the damage revealed itself, I couldn't resist a chuckle at my own expense, for when recalling that they said they "had a smashing time," I added that they didn't smash anything—but apparently spoke out of my turn!

The "C.E. Dept." Gets Busy!

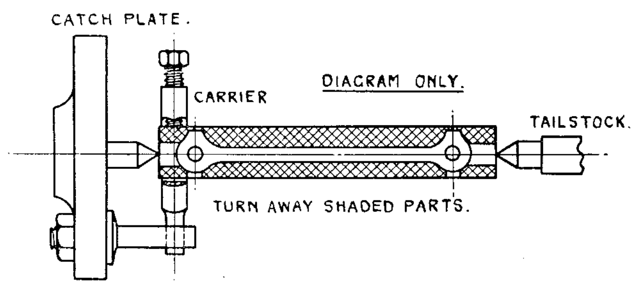
Well, I just followed full-size practice; when anything goes wrong and stops the traffic, the C.E. dept. has to get a move on, and restore the train service as soon as possible. Thanks to the kindness of Mr. L. T. Truett, who supplied new longitudinals, and one of his carpenters, who came along in his own time and erected them, the line is now O.K. again. I lifted about 30 ft. of the permanent-way, and removed all the old rotted timbers, so that all the carpenter had to do, was to fit the new stuff, and level it. Then I got busy with the creosote (incidentally 3s. 9d. per gallon —I paid 10d. when the line was originally erected!) and finally relaid the rails, taking advantage of the chance to renew split sleepers, and cut out the "insert" pieces of rail which had been needed, as mentioned previously. This necessitated one complete length of new rails for all the gauges, and new sleepers; fortunately I had enough material in hand to do the job. I rigged up a temporary four-wheeled car, with rigid bearings, to help iron out the "'umps and 'ollers," as the old gang would have said; and on the evening of September 23rd, the line was opened for traffic once more—just in time, for the "Three Musketeers of Kent," as I nicknamed my old friends from Tunbridge Wells, were due to pay a visit on the following day.



Coupling-rods

Whilst waiting for the new timbers, I snatched time to recondition three of my flat cars, re-turning the badly-grooved wheels, fitting new brake-gear, and generally titivating them up. The "boys" duly arrived, and we had a fine afternoon and evening, running till well after dark, with not a single derailment, and no trouble entering the south curve at a good lick, as I restored the transition when re-laying.

Normal working is now resumed, and there has been no further trouble; but I fervently wish that I had steel girders or concrete arches, instead of the timber!



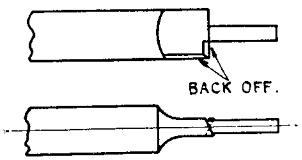
An easy way of forming coupling-rods

Beginners' Corner — Coupling-rods for "Tich"

The coupling-rods for "Tich" are cut from steel bar $\frac{3}{16}$ in. thick, and $\frac{9}{16}$ in. or $\frac{5}{8}$ in. wide, two pieces $4\frac{7}{8}$ in. long being needed. Mark out one of them to the outline shown; but before centre-popping to drill the crankpin holes, check off the axle centres on your own

chassis. If they are $4\frac{1}{4}$ in. apart, all sereny; but if not, *mark the centres of your coupling-rods to correspond*, otherwise they will bind at certain parts of the revolution. Drill a $\frac{1}{8}$-in. hole at each centre-pop, then use the drilled rod as a jig to drill the second one. Rivet temporarily together with bits of $\frac{1}{8}$-in. wire, so that both rods can be operated on at once, if they are to be milled.

Anybody owning a milling machine, can clamp the bits of rod in the machine vice on the



Pin-drill

table, and traverse them under a small slabbing cutter, not less than $\frac{1}{2}$ in. wide, feeding into cut by raising the table. If the machine is inclined to be flimsy, and the cutter chatters, take two or more cuts. Use plenty of cutting oil. The front faces are recessed by screwing the rods to a bit of steel bar, anything over $\frac{5}{8}$ in. square, held in the machine vice. This allows the cutter to do its job without causing the rods to spring. However, milling machines being scarce in home workshops, the lathe can be used, or even the common but useful hacksaw. The detail illustrations show easy methods, doing one rod at a time.

For hand-sawing, clamp the piece of bar in the bench vice, with the marked line level with top of jaws. File a slot at the end, just wide enough to let the hacksaw blade pass. Put a blade on its side in the hacksaw frame, insert in slot, and saw along, using top of vice-jaws as guide. Slap on some cutting oil with a brush; it makes sawing easier, the blade lasts longer, and the cut comes out nice and straight. Saw down to meet the horizontal cut, when you reach the boss. Cut the bottom bit out in like manner, then finish with a file. Be careful when rounding off the bosses.

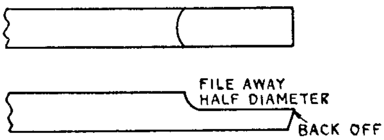
The bulk of the unwanted metal can be turned off, by mounting the piece of bar between centres, with a carrier on one end, as shown in the other illustration, which practically explains itself. This method, of course, leaves the centre part of the rod rounded at top and bottom, and it has to be finished off with a file; but the method saves a lot of "donkey-work." A simple jig can be made, to obtain nicely-rounded bosses. Chuck a bit of $\frac{1}{2}$-in. round silver-steel in the three-jaw, turn a pip on the end to fit the holes in the bosses, and a bare 3/32 in. long. Part off at $\frac{1}{4}$ in. from the end, and repeat operation. Harden the two pieces right out, by heating to red and dropping into water. Put one at each side of the boss, with the pips in the holes; grip the lot in the bench vice, and file away the superfluous metal projecting beyond the "buttons"—but don't file away the bit which stands out at the top and represents the oil box on a full-size rod!

Open out the hole at the front end of each rod with a $\frac{3}{8}$-in. pin-drill, to a depth of $\frac{1}{16}$ in. The pin-drill you can make as easily as the slotting cutter; in fact, it is the same thing plus a pin where the nick was filed. Chuck a bit of $\frac{3}{8}$-in. round silver-steel in the three-jaw; face the end, centre, and drill down with a No. 32 drill for about $\frac{1}{4}$ in. depth. Now proceed exactly as described for the slotting cutter, filing away the sides, backing off, hardening and tempering. Put a bit of $\frac{1}{8}$-in. round silver-steel, $\frac{1}{2}$ in. long, in your three-jaw; and with the lathe running as fast as possible without rocking the workshop, ease the end very slightly with a file, for about $\frac{1}{4}$ in. length, so it will just push tightly into the hole in the cutter. Press it in, and there is your pin-drill. Use it the same as an ordinary drill, lubricate with cutting oil, and don't run it too fast. Put something with a hole in it, either under the coupling-rod boss, if you are using a drilling machine, or between it and the tailstock drilling-pad, if using the lathe. Mind the drill doesn't penetrate too far; $\frac{1}{16}$ in. is plenty.

Put a $\frac{1}{4}$-in. drill through the hole at the opposite end, and a $\frac{3}{16}$-in. drill through the pin-drilled one, and try the rods on the crankpins. The wheels should turn without the least sign of binding anywhere; if they do bind, then either the rods haven't been drilled correctly, or the wheels not properly quartered. Try one at a time. If they bind when tried singly, the fault is in the rods; if O.K. singly, but bind when tried together, it is the wheels at fault. Correct by easing the holes with a rat-tail file, or shifting the wheels, as the case may be. When corrected, open out the pin-drilled ends to $\frac{1}{4}$ in., and the plain ends to $\frac{5}{16}$ in., ready for bushing.

How to Bush the Rods

For the pin-drilled ends, chuck a bit of $\frac{5}{16}$-in. round rod in three-jaw. Use good hard bronze or gunmetal; soft brass soon wears away on a little engine intended for a real job of hard work. Face the end, centre, and drill down about $\frac{3}{8}$ in. depth with No. 15 drill. Turn down the

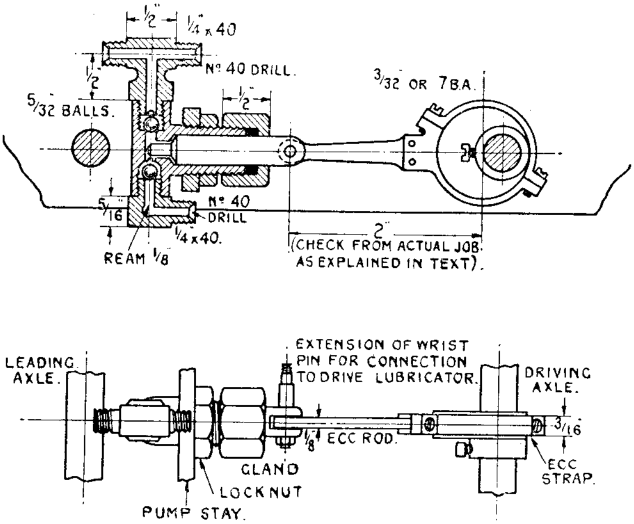


D-bit

outside to a press fit in the hole in the rod, same as described for turning the crankpins and the ends of the axles. If you "read, mark, learn, and inwardly digest"—as we used to say at school 60 years ago—previous lessons in turning and fitting, it saves you time, and saves your humble servant a lot of needless repetition. Part off two $\frac{1}{8}$-in. slices, and press them into the holes in the bosses.

For the driving ends, chuck a bit of $\frac{3}{8}$-in. rod; face, centre, and drill down a full $\frac{1}{8}$ in. with letter C drill if you have one; if not, use 15/64 in. Turn down $\frac{3}{16}$ in. length of the outside, to a press fit in the $\frac{5}{16}$-in. hole; part off a full $\frac{1}{16}$ in.

from the shoulder, or a full $\frac{1}{4}$ in. from the end. Repeat operation, then reverse each bush in the chuck, take a slight skim off the face, and just slightly chamfer the edge, that is, take the sharp edge off. A square-ended tool with the left-hand corner ground off at an angle of about



Feed pump for "Tich"

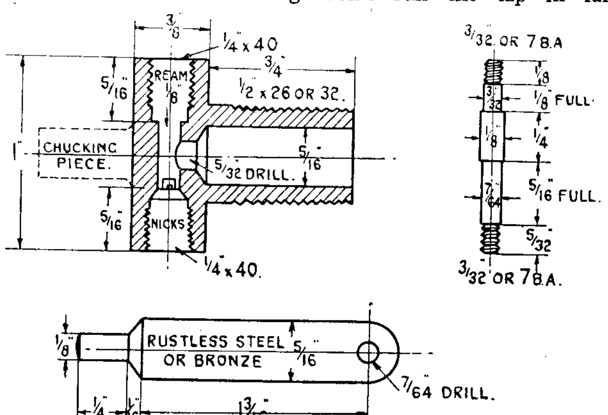
45 deg. is just the boy for skimming, chamfering, and light facing ; I have one in all my turrets. I always use a four-tool turret (home-made) on each of my lathes, as it saves such a lot of tool changing ; they are simply slewed around against a stop on the top slide, to bring any of the four tools into business position. A nut with a handle sticking out of the side, holds the turret to the top slide, and a flick of the handle either way, releases or locks the turret.

Press the bushes into the holes in the bosses, not forgetting that the flange goes on the same side as the recessed part of the rod. Drill a $\frac{1}{16}$-in. oil hole clean through each boss and bush, opening out for about $\frac{1}{8}$ in. depth with a $\frac{1}{8}$-in. drill, to hold a drop of oil ; see dotted lines in the illustration. Finally, ream the driving end with $\frac{1}{4}$-in. reamer, and either ream the pin-drilled end $\frac{3}{16}$ in., or put a $\frac{3}{16}$-in. drill through the bush. The leading end should be a little easier on the pin than the driving end. The rods can then be put on the wheels, securing the leading bosses with the specially-turned washers, held in place by ordinary commercial countersunk steel screws. No fixing is needed for the driving end, as the connecting-rod keeps that in place.

Boiler Feed Pump

Locomotives doing real work need plenty of water, so a pump is needed to keep the boiler well supplied. This is a simple gadget, driven by an eccentric on the driving axle, which has already been made and fitted. Our approved advertisers will be able to supply three small castings for the pump, and one for the eccentric strap ; the parts *can* be made from rod material, silver-soldered together, but castings save work, so I advise beginners to use them.

First chuck the body casting by one end of the valve box, keeping the barrel part right up close to the chuck jaws, and setting the opposite end of the valve box to run truly. Leave the jaws slightly slack ; tap the end with something light, such as a spanner head, until it runs truly when the lathe belt is pulled by hand, then tighten the jaws. Face off the end, centre, drill clean through with No. 33 drill, open out to $\frac{1}{4}$ in. depth with 7/32-in. drill, and bottom the hole with a 7/32-in. D-bit, to $\frac{5}{16}$ in. depth, to form a true seat for the ball valve. D-bits are easily home-made ; the illustration shows one. All you need for the 7/32-in. merchant, is a couple of inches of silver-steel of that size. File away about $\frac{3}{4}$ in. length to half the diameter, back off the end as shown, harden and temper exactly as described for the slot drill, and give the flat face a rub on an oilstone. Put it in the tailstock chuck, and feed it into the drilled hole until it cuts out the coned end left by the drill, and forms a flat seat $\frac{5}{16}$ in. from the end. Now tap the hole $\frac{1}{4}$ in. by 40, operating the tap from the tailstock chuck, as I described in a previous lesson. Warning—don't run the tap in far



Pump details

enough to catch the D-bitted seating and spoil it. Finally, take a weeny skim off the end, to remove any burring, and slightly countersink the hole with a $\frac{5}{16}$-in. drill.

The easiest way to set the opposite end to run truly, is to mount it on a screwed spigot like a gauge "O" mandrel nose. Chuck a bit of round rod of any diameter over $\frac{5}{8}$ in. in the three-

(*Continued on page* 578)

Making a Chuck Scroll

by C. W. Parris

HAVING a workshop consisting of second-hand tools, a certain amount of time has to be spent occasionally to keep them in a satisfactory working condition. When this occasion arises, it is annoying to come to an abrupt stop, when engaged on a model, owing to an item of the workshop equipment needing immediate attention.

Having concentrated on the job in hand, this can be quite an interesting diversion from the general run of work in model engineering. In fact, once a repair job has been completed it is not difficult to find another, and a lot of time can be spent on improvements generally. In fact, the work of repairing and improving equipment can provide a full time job, as it does for some people, until they have most of the accessories they need, leaving very few jobs which hold any terrors for them.

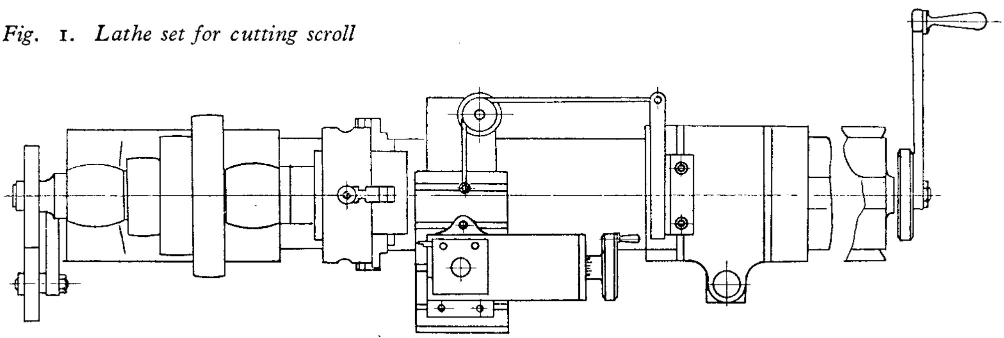
Most of us, however, are content to make do with the average workshop contents and when a particular problem arrives, resort to the simplest solution offering itself, so that work on a particular model is not unduly interrupted. Recently, a period of " make do and mend " arrived when the replacement of four new screws was necessary for the jaws of an independent four-jaw chuck. This was a straightforward job which turned out satisfactorily.

Having my independent chuck in service once more, I turned my attention to a 3-in. self-centring chuck, which had always been badly out of truth. To hold a job true in this chuck, a split bush had to be made and I thought it would be worth while trying to improve matters.

On dismantling the chuck I found, not to my surprise, that the scroll was very badly worn and to effect a repair, a new one would have to be made. The jaws, of which there are only one set (the " drill " jaws, I think they are called), were in good condition, as were the bevel pinions for operating the scroll. On checking the scroll I found it to be $2\frac{3}{8}$ in. o.d., $1\frac{1}{4}$ in. bore, leaving $\frac{9}{16}$ in. of actual scroll and this latter feature was all that had to be reproduced (apart from the bevel teeth on the back) to make the chuck live up to its name once more.

I could not obtain much information on cutting scrolls apart from that mentioned in an old turners' handbook. This described a method for a lathe with an independent cross-feed which could be varied by different trains of gears from the lathe mandrel to a cross-feed shaft at the back of the lathe, which drove a sliding worm and engaged a wormwheel attached to the cross-feed screw.

Fig. 1. Lathe set for cutting scroll



This method could not be adopted in my case as the lathe I have is a $4\frac{1}{4}$ in. single gear screwcutting type, similar to a round bed Drummond, but having a flat bed. It has no cross-feed drive or back-gear and although this has not been a serious defect before, it ruled out the above method and some other means had to be adopted. The idea of a system of levers, racks, etc. presented itself, and I was surprised at the different methods that could be devised to cut the scroll. Although simpler than fitting a cross-feed drive, the uncertain result of this method did not seem to justify the work involved in trying out these ideas. An attempt was made on these lines, however, but was abandoned for the following method (Fig. 1). This was a rig-up which, without entailing much labour, seemed to have possibilities of success and was simple in principle.

When checking the scroll I found that the pitch was 0.166 or 6 t.p.i. across the diameter. I set a train of wheels to cut this pitch in the normal manner on the lathe. This, of course, meant that 6 turns of the mandrel would move the saddle 1 in., and if this could be connected to the cross-slide (with the feed-screw removed) my difficulties would be solved.

As a modelmaker's problems are often unusual, I knew I might have to resort to the unorthodox, and so I turned to that source of inspiration, and one of the most valuable items of any workshop, the scrapbox. When faced with a problem one just rakes through, and even though the answer may not actually be

there, something will suggest itself. In my case, I unearthed a piece of bicycle chain and a small chain sprocket which could be used to couple the saddle and cross-slide.

Before I could use these, I had to arrange the cross-slide independently on the lathe bed. This was done with a piece of ½-in. plate, fitted with two pieces of similar material clamped under the lathe shears and the cross-slide was mounted on this with the feedscrew removed. I then bolted an angle-plate to the saddle and

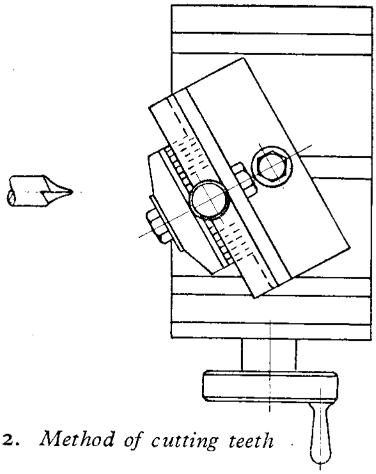


Fig. 2. Method of cutting teeth

anchored the chain to a piece of bar which was forked at one end to receive the chain, and bolted to the angle-plate. A pin was put through the forked end of the bar and the eye of the link.

The sprocket was then mounted on a pillar in front of the cross-slide, and the pillar screwed into a tapped hole in the ½-in. plate.

The end of the chain was passed round the sprocket and fixed to the cross-slide by a small bolt and nut clamped in one of the tee-slots. The end of the bolt was turned down to receive the link. With this arrangement the cross-slide travelled at the same rate as the saddle. I was now ready to test this scheme and decided to try first with a brass blank. This was held in the four-jaw chuck, the feedscrew replaced in the cross-slide, and the blank faced, bored and turned to the dimensions of the old scroll.

The lathe was then arranged for the scroll-cutting set-up, and a trial cut taken. On offering a chuck-jaw it seemed correct and the scroll was finished to depth by successive cuts. On trying the jaw again, I found it entered the scroll, but could not slide round and jammed in places. At first I thought it was due to uneven pitch and was not unduly surprised considering the rig-up. I eventually found, however, that the places where the jaw jammed, were where the scroll started on the o.d. and finished at the i.d.

This was due to the spring between the slide and saddle. At the beginning of the cut, as the tool advanced, the slide held back, but once it was cutting the full width, the rate of feed was constant. When the tool came off the cut at the centre of the scroll, however, the resistance of the tool gradually decreased the spring in the slide, etc., releasing the tool so that the rate of travel was greater at the end of the cut, causing an error in pitch at the start and finish of the scroll.

This state of affairs was overcome by refacing the blank and leaving it as large as possible on the o.d. and smaller at the i.d., recutting the scroll and then turning to finished size.

The jaws then entered and fitted the scroll quite well and with a tool 0.002 in. bigger than the teeth in the chuck jaws, they slid round with no appreciable slack.

The material from which the original scroll was made was in its soft state, with no signs of hardening or heat treatment and so I decided to use a piece of tool-steel I had which would just do the job.

I turned this oversize as before and proceeded to produce the scroll, but this did not prove as easy on the brass blank, the tool tending to dig in. By adjusting the slide and fitting a strip underneath to support it, I eliminated the tilting of the slide and by taking very light cuts succeeded in producing a good scroll. I must state here that a packing strip was necessary owing to the method of fixing the cross-slide on this type of lathe; this is done by a pillar or long spigot underneath the slide which is clamped in a split boss in the saddle. This is not an ideal method of fixing as the slide has a lot of overhang and can spring with a heavy cut, necessitating adjusting the slide very closely. With this arrangement for cutting the scroll, the slide had to move freely and the strip was fitted to give support to the front of the slide. The gearing being stepped up from the mandrel to the leadscrew, which is 10 t.p.i., I did not drive the lathe by power. But by fitting an extension handle (a bicycle crank) to the leadscrew, I was able to drive the lathe by this, a method I usually adopt when screwcutting owing to the lack of a back-gear. After each cut the saddle was run back and the cross-slide pulled back until the chain was taut, for the next cut.

On assembling the scroll in the chuck, the jaws were lapped with a little metal polish to

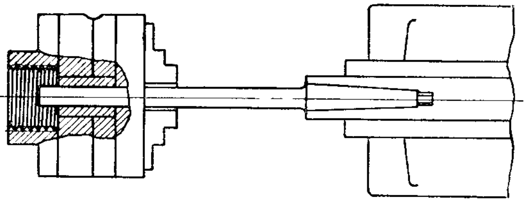


Fig. 3. Arrangement for lapping jaws

remove the harsh places until it operated smoothly. The scroll was left ¼ in. long, which was sufficient to grip in the vice and rotate the body of the chuck.

The next operation was to cut the gear on the back of the scroll. First it was set in the four-jaw chuck and faced to 13/32 in. thickness, and the cross-slide was then set to the angle on the old scroll and turned back the correct amount. A bush was made to fit the bore of the scroll and also to fit the bore of a 40-tooth change-

wheel, and being a good fit in both, was drilled $\frac{3}{8}$ in. I had intended to mill the teeth with a fly-cutter mounted between centres, but there was not enough room for this method. The only other methods were to shape the teeth with a form tool or mill them with a cutter in the chuck. The latter seemed to me the best, and a cutter was made to the shape of the teeth in the old scroll, which were badly worn, but making allowance for this, I hoped for the best.

The scroll and the gear were mounted on an angle-plate bolted to the cross-slide. A knurled screw, turned down to fit the gear teeth was used as an index and attached to the angle-plate by a bracket (Fig. 2).

With the cutter in the four-jaw and the angle-plate set round to the correct angle, the teeth were cut by traversing the scroll across the cutter. Once this operation was set for depth, I was able to cut each tooth with one traverse to the centre of the scroll, and then winding back to the outside of the scroll slacken the bolt and index screw, move the gear round one tooth, tighten everything again and cut the next tooth.

When finished, the scroll was removed from the bush and the teeth trimmed to remove the burrs. I also removed the thin ends of the scroll, where it started and finished, with a small chisel and file.

On assembling the new scroll to the chuck, the gears operated a little stiffly, but an application of metal polish once more did the trick and after washing in paraffin and oiling, worked smoothly.

Not having a toolpost grinder, I thought I would have to soften the jaws for truing up, but did not want to do this if it could be avoided, as I was not sure of the material of the jaws or how they were hardened. I made a start by screwing the chuck on the mandrel nose, and trying a piece of ground rod, found it did not run true.

I decided to correct this error in the following manner. The body of the chuck has a hole bored 21/32 in. through it and a brass bush was turned to fit this, bored $\frac{3}{8}$ in. It was then pressed in the chuck body and having a piece of rod $\frac{3}{8}$ in. diameter with a No. 1 Morse taper on one end, I put this in the tailstock mandrel, and mounting the chuck with the bush in it, entered the bar through the bush and locked the tailstock. Grinding paste was then put on the rod just where the jaws were, and the chuck tightened until one jaw was just touching the rod. With the lathe running the rod was traversed backwards and forwards until the offending jaw was lapped down. Again the chuck was tightened and lapped until all three jaws bedded on the rod (Fig. 3). The chuck was once more tightened until it was quite stiff to turn, and a final lap completed the job. This operation did not take as long as I had expected, only about 30 minutes, and produced the jaws with new faces ground at the natural angle when gripping. On most chucks the jaws tilt when gripping, owing to slackness in the grooves of the jaws. In my case the slack was considerable, and when lapped were appreciably out of square. However, on trying the rod again, a great improvement was shown and the average amount of error was 0.002 in. On trying rods of various diameters, this error seemed fairly constant and I was well satisfied with the result, as previously the chuck was out of truth to 1/32 in. at least. Having one or two ballrace outer rings, I held these in the chuck by the bores and checked the stepped faces of the jaws by clocking the outside of the race rings. I expected to see more error than the .002 in. it showed, and decided, in view of the state of the chuck in the first place, to leave it at that and see how it checked after being used. The fact of steps on the jaws being in good condition, and not having had much wear proved that the new scroll was cut almost as accurately as the original when new.

One point I should mention which is peculiar to many self-centring chucks, that by tightening on one pinion, results were better than when using either of the other two. This, I presume, is the one I used on the last stage of lapping, and tightening on this throws the scroll in the same direction as when lapped.

This then concludes the story of a scroll, which started with some trepidation, and finished quite successfully without precision equipment.

The next job, when the will and the time coincide, will be a set of outside-jaws already described by the Rev. H. W. Young in a previous issue of this journal.

For the Bookshelf

Period Ship Modelling, by R. K. Battson. (London: Percival Marshall & Co. Ltd.) Price 3s. 6d.

Strictly speaking, all ship modelling belongs to one period or another, but the expression like "period" furniture or "period" architecture when applied to ship modelling always seems to imply the Elizabethan or sometimes the Restoration period. In this case it is the Elizabethan period. The scope of the book is indicated in the author's sub-title where he describes it as "Constructional notes with sixty-five diagrams on the making of an Elizabethan galleon." Four reproductions of photographs of the finished model are also included. The book gives a number of very useful hints on the construction of hull details and also a detailed description of the rigging. The line drawings are by G. F. Campbell and are notable for their clarity and accuracy. If the book is read and studied as it deserves, the standard of "ship-piness" in the model galleon will be improved very considerably. Although the book is more or less based on the drawings of the Elizabethan galleon in the Science Museum at South Kensington, it will be found to be extremely useful to anyone who builds model galleons.

We regret that in our review of Mr. Lawson Finch's book, *The Rother Valley Railway*, in our issue for October 6th, we omitted to mention the price, which is 7s. 6d. net.

IN THE WORKSHOP

by "Duplex"

49—A Saddle Traversing Gear and Fine Feed

WHEN turning a piece of work in the lathe to form a shoulder at an exact distance from its end, as determined by the leadscrew index, some machinists use the automatic feed for nearly the full distance, and then complete the operation by hand-feeding with the leadscrew handle until the leadscrew index registers the correct distance.

If, to allow hand feeding from the rack gear, the leadscrew claspnut is disengaged, the leadscrew index no longer acts as a guide, and if the lathe is stopped and the cluster gear put into the neutral position, the train of change-wheels will have to be revolved as the leadscrew is turned. Where a fine feed has been set up, hand-feeding will then have a considerable resistance to overcome in revolving the wheel train, and this may lead to difficulty in turning the leadscrew index to exactly the right point. If, on the other hand, the leadscrew is driven by means of a hand-controlled dog clutch, as in the Myford-Drummond lathe, this difficulty is easily overcome, as the leadscrew can be disconnected from and reconnected with the mandrel drive at will.

In this connection, we were asked recently by a friend if a disconnecting device of this sort could be designed and fitted to his Myford M.L.7 lathe.

The following notes will explain how this was done, and it may, perhaps, be permitted to record that the owner is very pleased with the result and affirms that it has added greatly to the effectiveness of his lathe and to his pleasure in using it. It was, in fact, found that, when using the device, engagement and disengagement of the leadscrew drive could be effected instantly by a touch of the finger, so that there was no difficulty in traversing the tool along the work in steps of 5 thousandths of an inch or less.

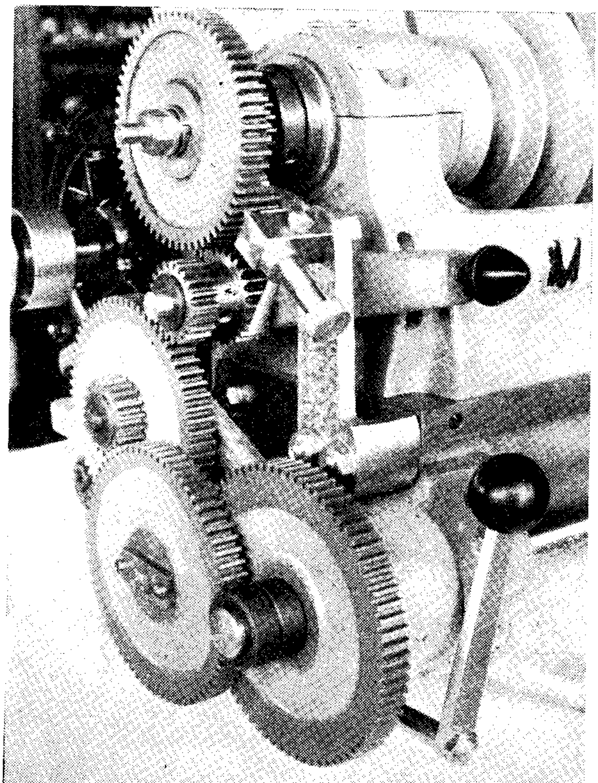


Fig. 1. Showing the gear fitted to the lathe

The appearance of the lathe with the device fitted is illustrated in Fig. 1, and the details of the mechanism when detached from the end of the bed are shown in Fig. 2.

To make the construction clear, a sectional drawing is given in Fig. 3 to show the relationship of the parts.

The operating gear is attached to a motion plate which is clamped to the lower limb of the lathe quadrant by means of a backing plate carrying two studs fitted with nuts.

The ball-ended lever turns the operating shaft, which in turn rotates the fork attached to it. This fork carries two trunnions which engage with the bobbin fitted to the wheel spindle. Attached to the outer end of this spindle is a plate which is secured to the 70-tooth change-wheel.

When, therefore, the hand lever is moved to the left, the 70-tooth wheel is unmeshed from the preceding 20-tooth wheel and, at the same time, the 20-tooth wheel carried on the same stud is disengaged from the 75-tooth wheel attached to the leadscrew. By this means, the leadscrew is made free to revolve without turning any of the change-wheels. The wheels concerned are so mounted that when the 70-tooth wheel is

moved to the right, it first engages the preceding 20-tooth wheel and is itself caused to revolve; further movement towards the right brings the 20-tooth wheel on the same stud into mesh with the stationary 75-tooth leadscrew wheel.

As will be described later, a spring detent maintains the parts in either the in-gear or in the out-of-gear positions.

Although it seemed possible to fit the device and, at the same time, to retain the wheel guard with some minor alterations, this was not attempted, as the owner, like many amateur workers, preferred to have the lathe as little encumbered as possible in order to gain greater freedom of working.

Constructing the Mechanism

A start may be made by mounting the pair of sliding change-wheels on the quadrant, that is to say the 70-tooth and the 20-tooth wheels which are carried on a common bush and keyed together. For this purpose, a new hollow stud is required as illustrated in Fig. 4 (1).

As it is essential for smooth working that the bore of this stud should be concentric with the outer diameter on which the wheels slide, a piece of $\frac{3}{4}$ in. diameter mild-steel is gripped in the chuck and, after the wheel seat has been turned, the bore is formed with a D-bit made from a length of $\frac{3}{16}$ in. diameter silver-steel. The stud is next reversed and centred in the four-jaw chuck for turning and threading the portion which is secured to the quadrant. As an alternative method of machining, the part may be first drilled and reamed and then mounted by its bore between the lathe centres for turning both the wheel seat and the threaded portion.

The silver-steel spindle (2) is threaded at one end to carry the bobbin (4) and at the other to mount the plate (3) which is attached to the 70-tooth sliding wheel.

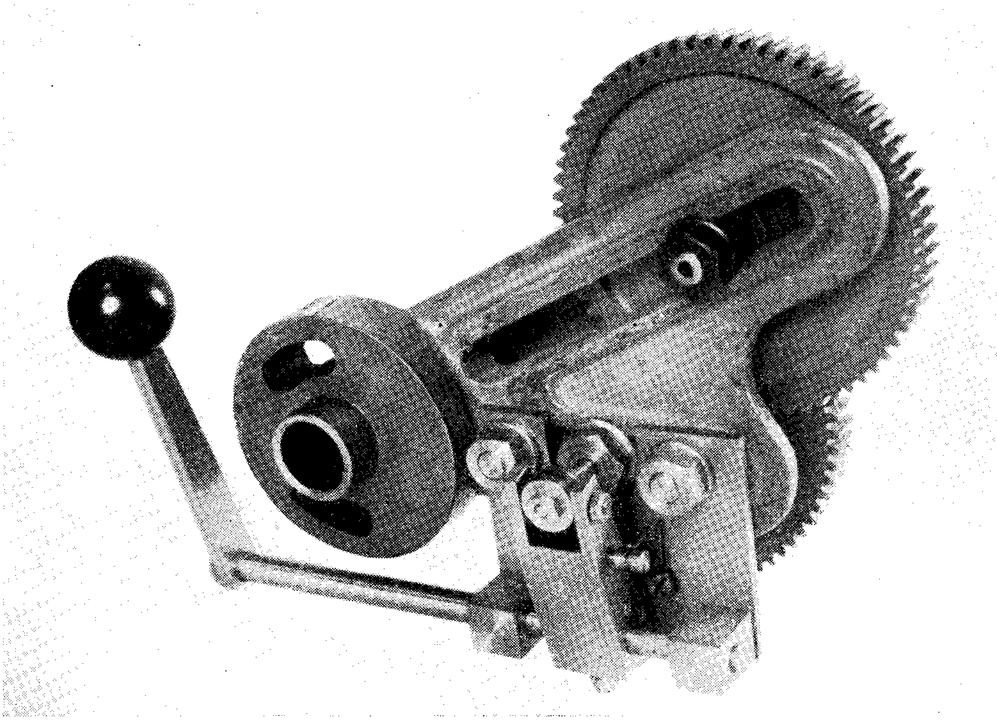


Fig. 2. View of the back of the gear

With the spindle inserted in the stud and the wheel mounted on its seat, the plate can be used as a drilling jig for drilling the screw holes in the wheel itself; this will ensure that the spindle is attached centrally to the wheel in order to afford smooth working.

The bobbin is turned either from mild-steel and then case-hardened, or it can be made of silver-steel and hardened.

When the parts have been assembled on the quadrant, the spindle should slide freely in the stud.

The next operation is to make the motion plate (5) which can be clearly seen in the photograph, Fig. 2, whilst its dimensions are given in Fig. 5. This part is made from mild-steel strip, $\frac{1}{8}$ in. thick, and the gap should be cut out with the hacksaw and file to avoid distorting the material.

The two bearing blocks (6) which carry the operating shaft are made from $\frac{1}{2}$ in. square mild-steel and are secured in place as shown in the illustrations.

The motion plate is attached to the lower

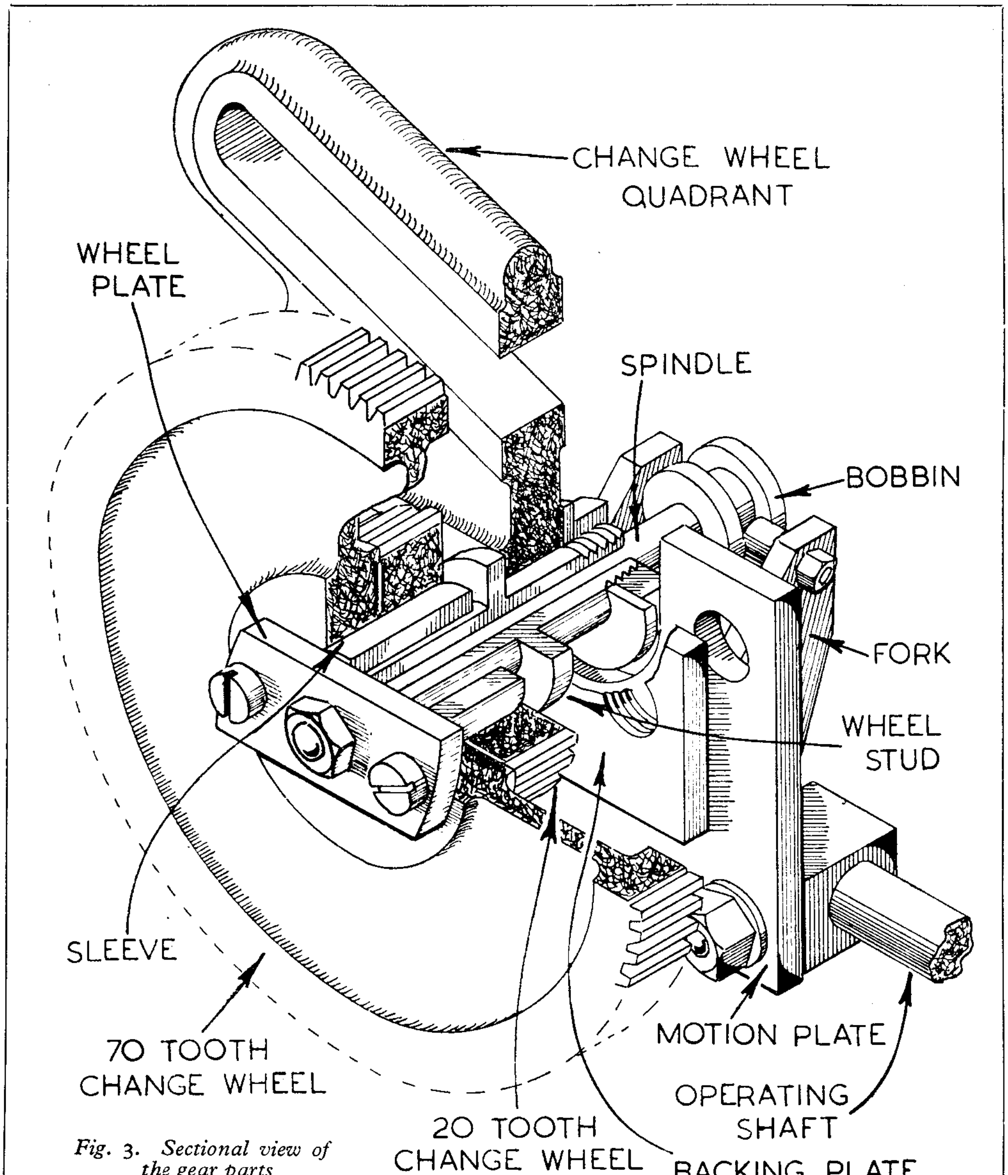


Fig. 3. Sectional view of the gear parts

limb of the lathe quadrant by means of a backing plate (7) fitted with two studs and nuts. The dimensions of this part are given in Fig. 6.

The operating shaft (8) Fig. 6, can now be made and threaded for the attachment of the hand lever (9) which is secured in place by a lock-nut.

To actuate the spindle and so move the change-wheels attached to it, a fork (10), shown in Fig. 7, is secured to the operating shaft. As represented in the drawing, this part is built up, but, if preferred, it can be machined from the solid, although this form of construction makes the fitting of the trunnion screws less easy. The two trunnions, one of which is shown in Fig. 3, are made a press fit in the fork and are further secured with lock-nuts. In order to resist wear, the trunnions should be hardened.

The fork is secured to the operating shaft by means of a 2-B.A. clamp-screw which engages a dimple drilled in the shaft.

It will be observed that the fork is free to line itself with the bobbin, and also the position of the hand lever can be set as required on the operating shaft.

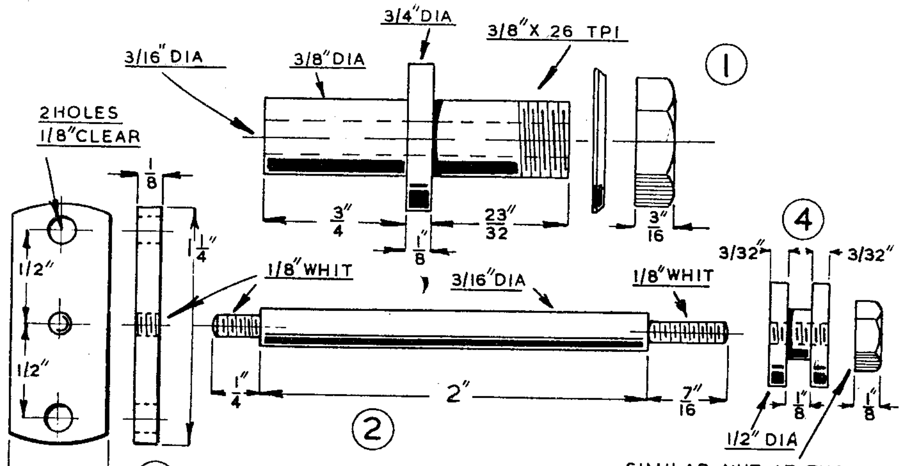


Fig. 4. The wheel stud and operating spindle

The upper 4-B.A. screw, shown in Fig. 7 and used to secure the parts of the fork together, has an extended tip which serves to carry the grooved roller (11). This roller, which is hardened, rides on the spring (12), Fig. 8, and acts as a spring detent for maintaining the fork in either the backward or the forward position, according to whether the change-wheel is put into mesh or is disengaged.

The shape of the spring is shown in the drawing, and its position and mode of action are clearly seen in the photograph, Fig. 2.

When the parts have been assembled in the quadrant and found to work smoothly with light finger pressure only, the gear can be fitted to the lathe. To do this, the 75-tooth wheel, which fits on the end of the leadscrew, is held in the hand against the 20-tooth wheel with which

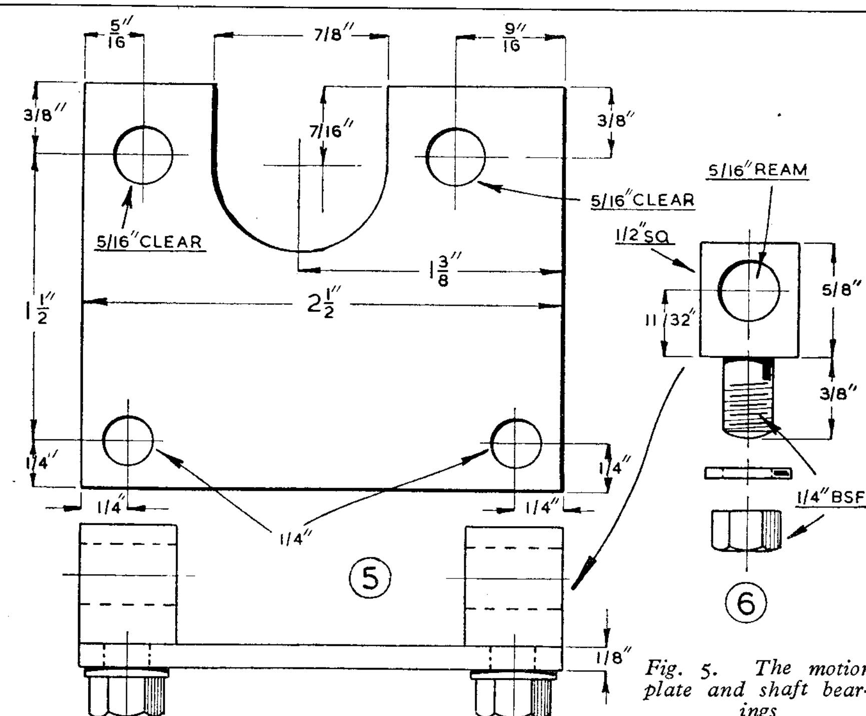


Fig. 5. The motion plate and shaft bearings

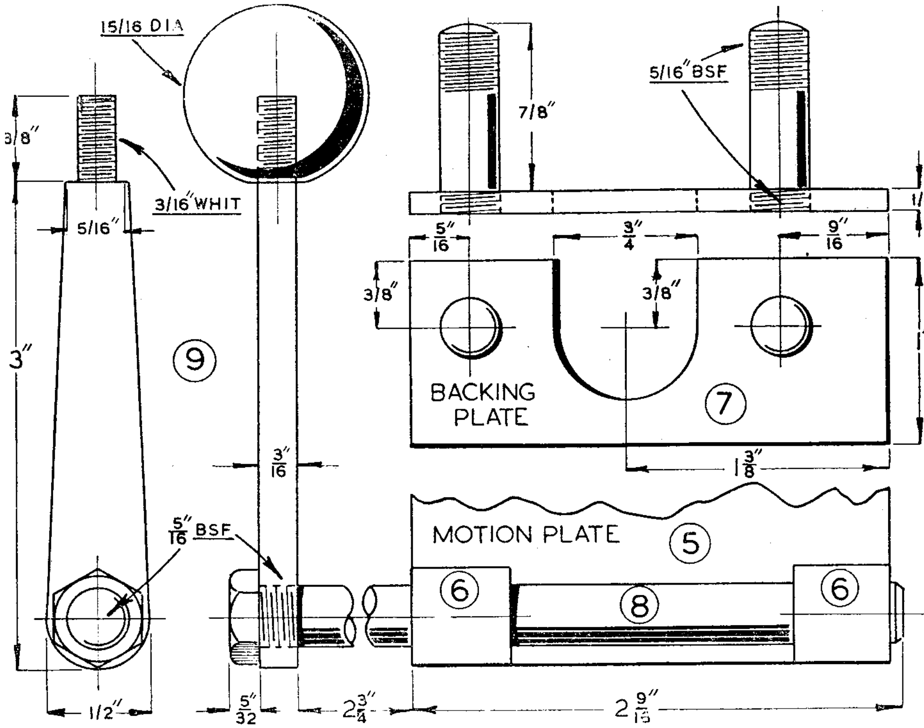


Fig. 6. The backing plate and operating shaft and handle

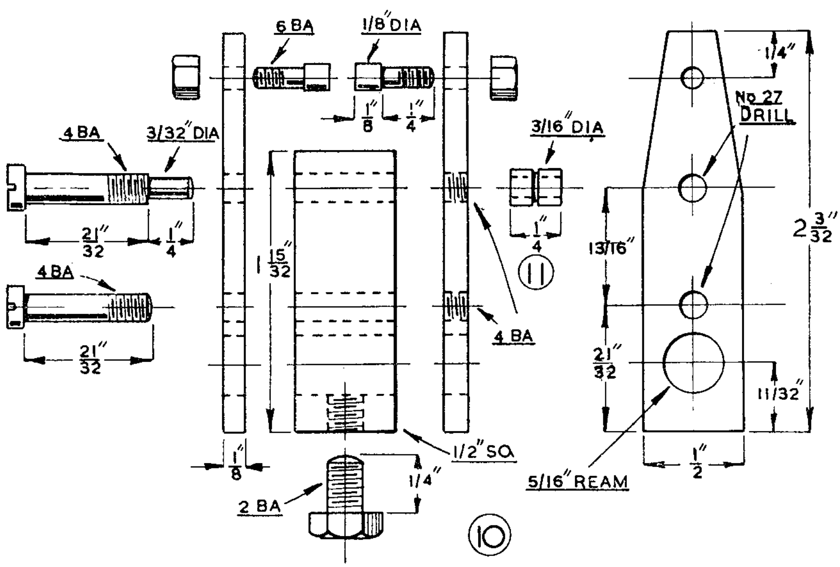


Fig. 7. The gear fork assembly

it mates, and the assembly is threaded on to the end of the leadscrew to enable the Woodruffe key to be inserted before the quadrant is pushed right home.

It may be found that the extreme tips of the key have to be filed off to allow it to be put in

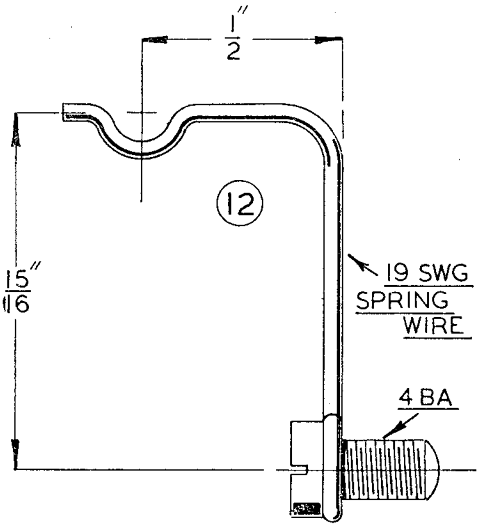


Fig. 8. The detent spring

place. The same procedure is adopted when removing the gear from the lathe, and a pair of pliers may be required to lift the key if it is a tight fit in its seating.

With the lathe running and with the leadscrew clasp-nut engaged, it will be found, if the work has been carefully carried out, that the gears can be thrown rapidly in or out of mesh with a touch of the finger on the hand lever.

As previously mentioned, it is essential that the initial movement of the hand lever should bring the 70-tooth wheel sufficiently into mesh with the revolving 20-tooth mandrel wheel to start it turning. This will also put the 20-tooth wheel, mounted on the same stud, in motion and so will enable it to mesh with the leadscrew wheel.

If on the other hand, the two stationary wheels are first brought into contact, it will not always be possible for them to mesh. The relative positions of the wheels may, therefore, have to be slightly altered by making adjustments to the wheel studs to ensure that the wheels mesh in the correct sequence.

Screwcutting

As assembly of the gear on the quadrant takes some little time, it is, perhaps, best to leave it in place and to keep a spare quadrant for screwcutting operations; in any case, the wheels would have to be changed when altering a fine feed arrangement to a screwcutting train, so little, if any, time will be wasted.

Fine Feeds

The following table shows the rates of feed obtainable when using the attachment with the arrangement of wheels described.

1st Stud 65/20 : 2nd Stud 70 20 : Leadscrew 75

Mandrel Driving Wheel	Turns per in. Feed
20-tooth	341
25 ,,	273
30 ,,	227
35 ,,	195

These feeds should be suitable for all ordinary work and are obtained by changing one wheel only.

"L.B.S.C."

(*Continued from page* 569)

jaw. Face the end, and turn down 3/16 in. of the end to 1/4 in. diameter, using a knife tool, so as to leave a shoulder. Screw 1/4 in. by 40 with a die in the tailstock chuck, operating as per previous instructions. Don't remove this from the chuck, but screw the machined and tapped end of the valve-box on to it; the outer end will then run truly.

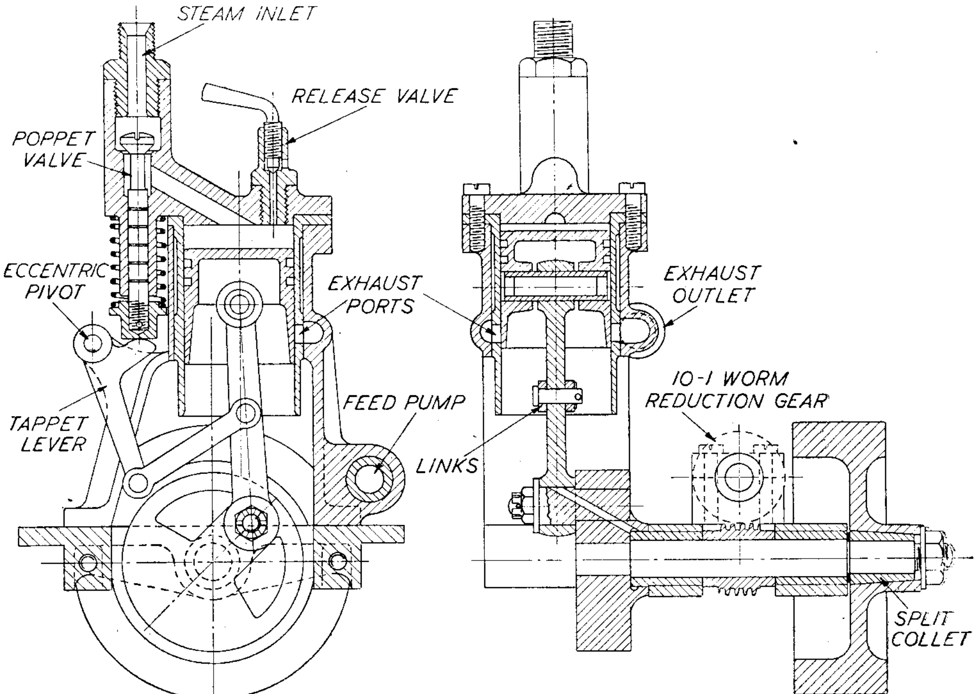
Face off the end, open out to 5/16 in. depth with 7/32 in. drill, tap 1/4 in. by 40, countersink, and skim off any burr, exactly the same as the previous end, except that the D-bit is not needed. Instead, make a couple of nicks at the entrance of the small hole, with a little chisel made from a bit of 1/8-in. silver-steel. File the end like a screw-driver, harden and temper same as described for slot drill. Put a 1/8-in. parallel reamer through the remnants of the No. 33 drill hole; this may be done by hand, using a tapwrench to turn the reamer. On the back of the valve box there will be a chucking-piece cast on, for gripping in the chuck whilst machining the barrel; put this in the three-jaw, and if the barrel doesn't run truly, give it a gentle tap or two with something light, until it does, then tighten chuck jaws. Face the end, centre, and drill clean through into the valve box with a 5/32 in. or No. 21 drill. Open out to 3/4 in. depth with a 5/16 in. drill. Turn down 5/8 in. of the outside, to 1/2 in. diameter, and screw it 1/2 in. by 26 or 32, to suit the tapped hole in the pump stay, which is already fitted to the chassis. Saw off the chucking piece, and file away the stub, smoothing it off to the outline of the valve box. That completes the body machining, and we will leave the rest of the pump till the next instalment.

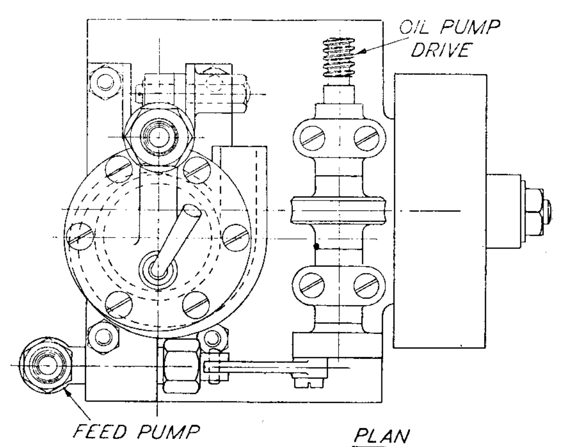
*UTILITY STEAM ENGINES

by Edgar T. Westbury

AT the request of many readers, I am illustrating some further ideas for model steam engine designs which are somewhat off the beaten track, and may appeal to constructors who wish to escape from convention. Complete originality, of course, cannot be claimed for these designs—indeed, it would be difficult to find anything really new in steam engine design nowadays—but they incorporate several novel features and have possibilities for development.

Considerable interest has been aroused by my remarks on the Uniflow principle as applied to





A proposed design for a poppet-valve Uniflow engine with link-operated valve-gear

*Continued from page 500, "M.E.," October 20, 1949.

high-speed model steam engines, and more information on this subject is asked for. It is, however, extremely difficult to satisfy the demands of readers who ask for comparative data as to the performance and steam consumption of such engines in relation to that of more conventional types, as very few small steam engines of any type have ever been accurately tested; and a considerable amount of patient and careful research work would be necessary to establish authentic facts. All that I can state definitely is that sufficient evidence is available to convince me that the Uniflow engine deserves more attention than it has hitherto received from designers of high-performance steam plants.

Many years ago I designed an engine for a friend who had ambitions to produce a record-breaking flash steam hydroplane. From observations of the general tendencies in the design of flash steam plants at the time, I concluded that most of them were mechanically inefficient, and some were structurally unsound, so that if they actually developed the power expected of them, they would be very liable to breakdown of some vital working parts. To some extent, this is still true, and a very weak link in many engine structures is the valve-gear, which is grossly overloaded, unbalanced, and very inefficiently lubricated. It was with the idea of improving this feature that the particular type of poppet-valve Uniflow engine shown here was designed. While it may be open to dispute whether the valve-gear structure was any more sound than that of conventional types of engines, it was at any rate carefully thought out, and I had great faith in its merits.

The most noticeable feature of this engine is that it dispenses with the usual eccentric, return crank, or cam for operating the single poppet-valve, this operation being performed by means of link gear actuated by the swing of the connecting-rod. This idea, of course, is basically as old as the hills, having been extensively used in connection with slide- and piston-valves in the past. The best known example of valve-gears of this class is the Joy valve-gear, in which provision is made for reversing and linking up, and many full-size and model locomotives have been equipped with this mechanism. Some years ago, the Peche link-operated valve-gear enjoyed a certain amount of popularity on high-speed stationary engines employed for driving electric generators of fairly large size; in this case, no reversing was called for, both the phase and stroke of the gear were fixed, and it drove a conventional piston-valve, distributing steam to both ends of a double-acting cylinder. A single-acting engine with link-operated piston-valve was described in the "M.E." a few years ago by Mr. T. W. Geary.

In the engine shown, the link attached to the connecting-rod at or near its central point operates a swinging bell crank lever, the short end of which forms a tappet for actuating the poppet admission valve. For the majority of its cycle, the lever swings idly, but the tappet engages the base of the valve for a limited period as the connecting-rod swings to the right near the top of its stroke, giving a very quick opening and cut-off to the valve. The action would tend to be noisy, owing to the lost motion being taken up very suddenly, but that is usually the last thing to worry about, and in other respects the gear is very lightly loaded and mechanically efficient. It tends to assist balancing of the engine, as the pendant part of the bell crank lever, and its operating link, are moving in opposite phase to the balance weight of the crank, during the periods around top and bottom centre, when this weight would itself normally be unbalanced.

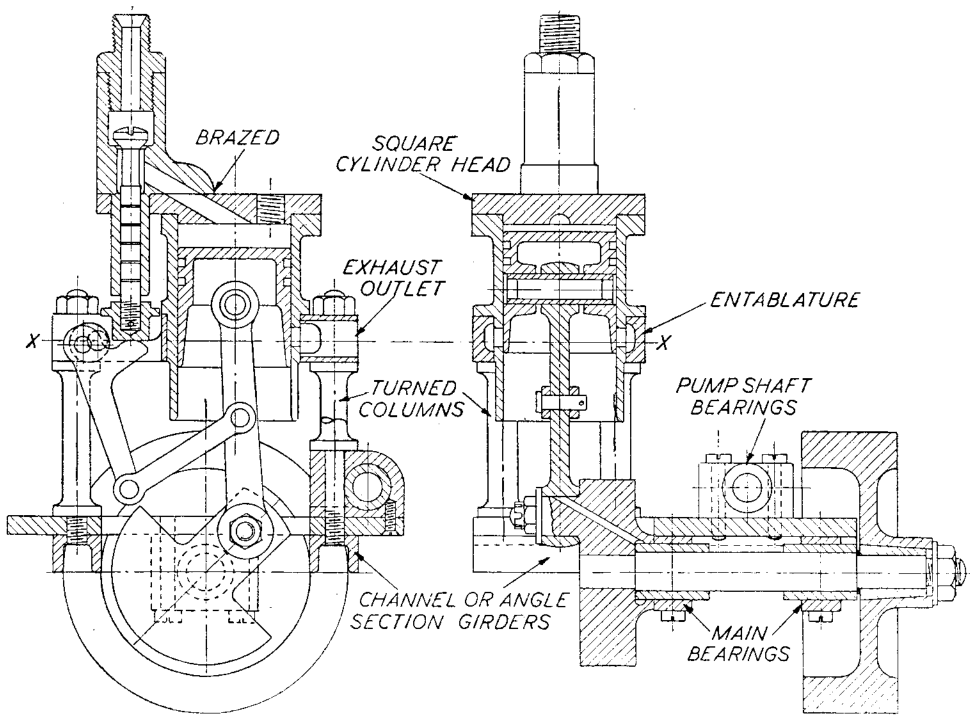
If one cares to work out a kinematic analysis of the motion of this gear, either by means of diagrams or a working model, it will be seen that it admits steam a few degrees before top dead centre and cuts off at about ¼ stroke, depending to some extent on the tappet clearance, which may be adjusted either by the position of the spring retaining collar on the valve stem, or the eccentric pivot of the bell crank lever. The latter may also be used to shift the phase of the lever—in other words, the angular timing—and it would be quite practicable to use it as a running adjustment if desired.

The cylinder is desaxé to a fairly pronounced extent, which also influences timing, but the main object is to reduce the side thrust of the piston on the working stroke, also impact shocks transmitted through the connecting-rod to the crank when working on very high steam pressure. In other respects, the engine follows standard principles of design, but is of very stiff and sturdy structure, and embodies provision for mounting and driving pumps, which are only too often tacked on as afterthoughts.

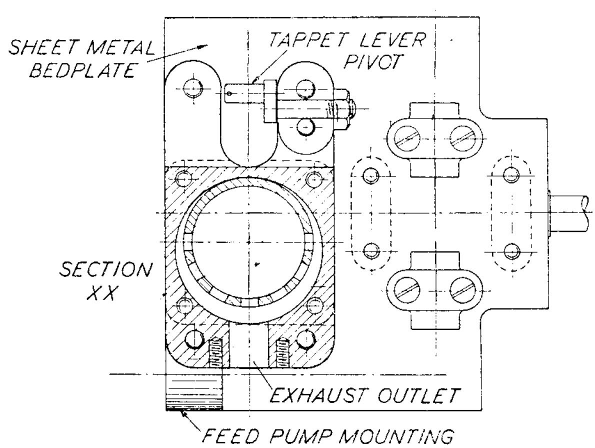
The engine was, as a matter of fact, never built in the originally designed form, owing to the difficulty of getting patterns and castings made at the time; but a modified version of the design was produced from stock material fabricated by brazing and bolting together, and proved fairly successful, until the owner started "improving" it! As a substitute for the main supporting column casting, the more usual turned steel columns were used, but while these showed no obvious lack of rigidity, I am strongly of the opinion that the casting would have been better, both in strength and appearance.

All the rods, links, and levers were made from mild-steel and case-hardened, likewise the pivots, and gave very good wear without the necessity for copious lubrication. It will be noted that double links are used to couple the bell crank to the connecting-rod, as this was considered simpler than making a forked link, and much better than a single offset link. Some anxiety was felt regarding the weakening of the connecting-rod by drilling the centre pivot hole for the link, but it never actually caused any trouble. It might, however, have been improved in design by "swelling" the edges in the region of the pivot hole, or by making it a little heavier in section and drilling a series of holes, or fluting out the sides, above and below the pivot.

The crankshaft was built up by brazing, and it may be noted that lubrication of the crankpin is provided for by an annular collector ring or "banjo" with an oblique hole leading therefrom to the crankpin. In this way the excess oil escaping from the inner end of the main bearing is thrown into the big-end bearing by centrifugal



Modified design, adapted for fabricated construction



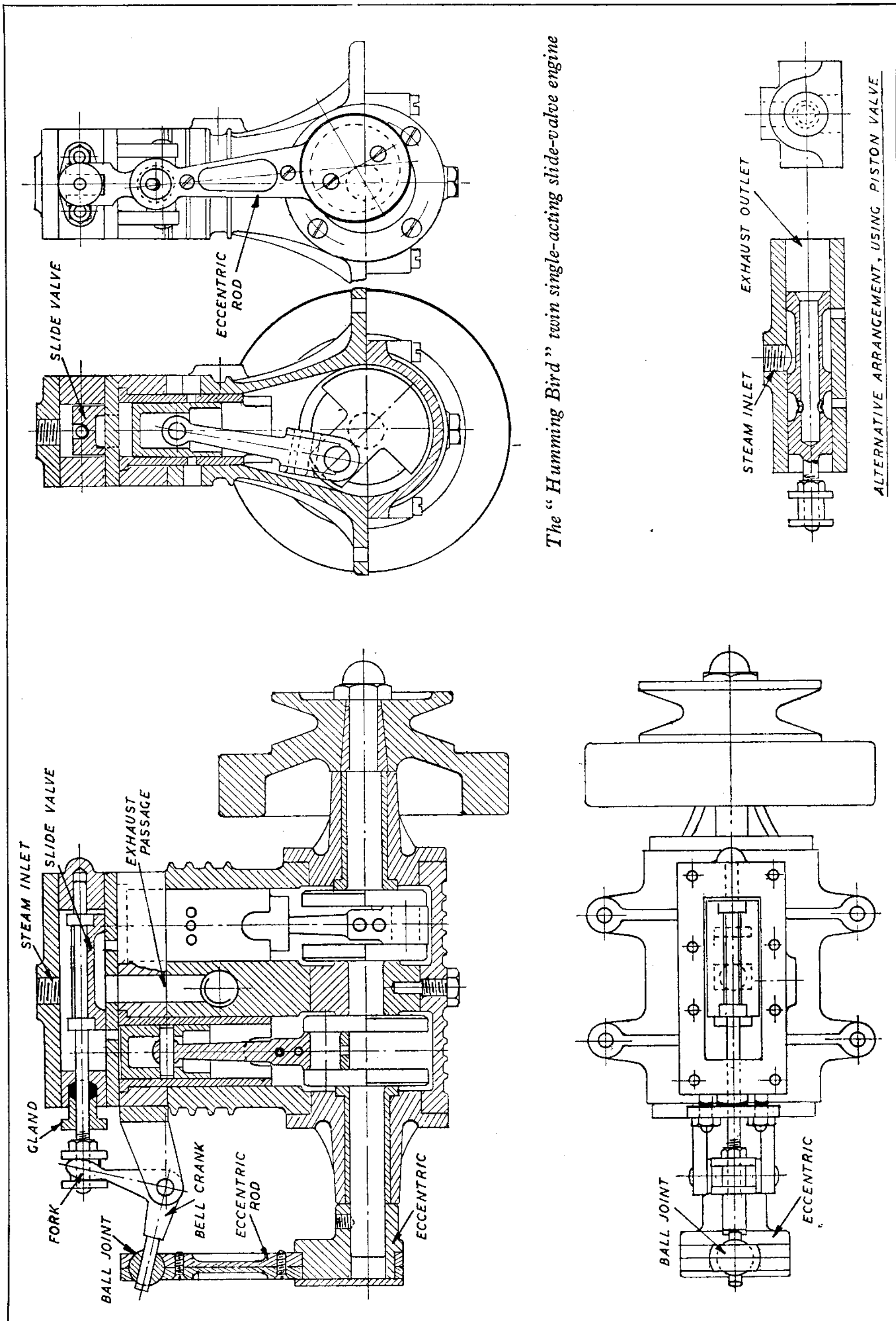
force, and the amount fed to the latter can be increased if necessary by cutting an oil channel in the main bearing. No oil feed inlets are shown in the drawings, but these were, in fact, on the top side of each main bearing.

The worm reduction gearing of 10 to 1 was intended to facilitate feed pump efficiency, by using a larger and slower-running pump than is usual on engines of this type. The end-thrust caused by worm gearing is often objected to, but in this case the hardened steel worm keyed to the shaft between the main bearings acted as its own thrust collar, and no evidence of undue friction was observed. Admiralty bronze was used for main bushes, wormshaft bearings and pump barrel; the crankshaft and pump shaft, including the oil pump worm, being of 3 per cent. nickel steel, left soft.

I have not given complete working drawings of either version of this design, as I consider that most of the readers who are interested in it will be able to obtain sufficient information from the general arrangement drawings, and it is more than probable that they will have their own ideas on detail modifications if they decide to build a similar engine. It is hoped, however, that the design will be of general interest, and I can assure readers that such an engine is capable of extremely high speed and produces plenty of power for its size.

A Vertical Twin Engine

In dealing with the construction of the "Ladybird" 2.5-c.c. twin compression-ignition engine under "Petrol Engine Topics" some weeks ago, I mentioned the possibility of adapting this design to work as a steam engine, using the same main castings and quite a number of the original



The "Humming Bird" twin single-acting slide-valve engine

working parts. Many readers were very intrigued by this idea and I have therefore been encouraged to go ahead with the adapted design. I have called this tiny engine the "Humming Bird," and it certainly will hum on quite a moderate steam pressure. The external neatness of the design, will I hope, attract many readers to build it, and it would form a very suitable power unit for a small steam launch or cabin cruiser. While not claimed to be a high-efficiency engine, it is quite as well adapted to high performance as many engines which have been specially designed for that purpose, and if well made, from the right materials, will stand up to the hardest work.

It will be seen that all the lower part of the engine is identical with the "Ladybird" engine, including the main body, bearing housings, crankshaft, flywheel and connecting-rods; the pistons are also the same except that they do not need to be machined away to form deflectors. At one end of the crankshaft (which may be extended if a drive is required at this end) an eccentric sheave is attached for driving the valve-gear. The cylinder liners are different to those of the c.i. engine, and are inserted in a rectangular spacing block of aluminium alloy which is attached to the body casting by long studs, the latter also being used to secure the valve chest and cover.

The single horizontal slide-valve is driven by a bell crank lever, the pivot of which is carried in a bracket attached to the end face of the spacing block. This particular form of valve actuating gear involves some awkward mechanical problems, as transmission of motion from the eccentric rod to the bell crank lever entails the necessity for articulation of the joint in two separate planes, and it is sometimes very clumsily and inefficiently carried out in practice. In this case universal articulation is obtained by a ball joint, utilising and ordinary steel bearing ball, softened and drilled through the centre, then rehardened in oil. It is a working fit on the leg of the bell crank lever, being thus free to rotate or slide as required.

The eccentric rod is preferably made of duralumin and lightened as much as possible. By making it in two layers as shown, the ball may readily be fitted to work freely and with proper bearing surface in each layer. A flat cutter or D-bit is made to form the holes to the correct shape, and working adjustment can be effected by introducing a shim between the layers, or filing down their contact faces, as required. The upper limb of the bell crank lever is made in the form of a fork, and drives the slide-valve by means of a flanged bobbin, adjustable on the valve spindle.

A long flat slide-valve is employed, working in the popular "picture-frame" form of steamchest, with a packed gland at one end and a tail guide at the other. The valve itself is of fairly normal design, and is driven by collars pinned to the spindle, fitting closely over the steps at the ends of the valve, a groove in the back of the latter giving clearance for the spindle, so that bedding down of the valve on the port face is not interfered with. Visible setting of the valve is easily possible by removing the top steamchest cover. The port face consists of a flat plate sandwiched between the steamchest and the spacing block, and the ports are simply slots milled or filed straight through it. Exhaust takes place in the normal way, through a centra port which communicates by a vertical drilled passage, to what would normally be the carburettor port in the original c.i. engine. Auxiliary uniflow exhaust ports may be provided in the cylinder walls, opening into the cored exhaust passages in the body, at the option of the constructor. They are quite unnecessary for engines of moderate performance, but if an attempt is made to extract the utmost power and speed from the engine by increasing steam supply pressure, they may be found beneficial.

All the auxiliary parts necessary for the conversion of the engine to run on steam are straightforward in design, and are easily made from the solid. The steamchest and cover, also the spacing block, may be made from light alloy, but I prefer to make actual working parts of material more resistant to wear. Cast-iron is recommended for the cylinder liners, though bronze may be used if the engine is run on low-pressure steam without any great superheat. A piece of stainless-steel plate 3/32 in. thick is recommended for the port face, but care should be taken to see that it is quite flat on both sides to ensure tight steam joints; a hard brass plate may be substituted if the duty is low. In either case, cast-iron or bronze may be used for the slide-valve. The working parts of the valve-gear such as the bell crank and its pivot, and preferably the eccentric sheave, should be case-hardened if high performance is intended.

Should a piston-valve be preferred to a flat slide-valve, the design may be modified as shown, by substituting a bored cast-iron block for the steamchest, cover and port plate. The piston-valve is of the inside admission type, so that it must be timed accordingly, by setting the eccentric to "follow" the crank instead of "leading" it, as in the case of the flat slide-valve with outside admission. Exhaust steam passes out at the end of the piston-valve barrel, so that the valve is made hollow, with cross passages, to convey exhaust from the remote end cylinder port to the outlet. The most suitable material for the piston-valve is stainless-steel.

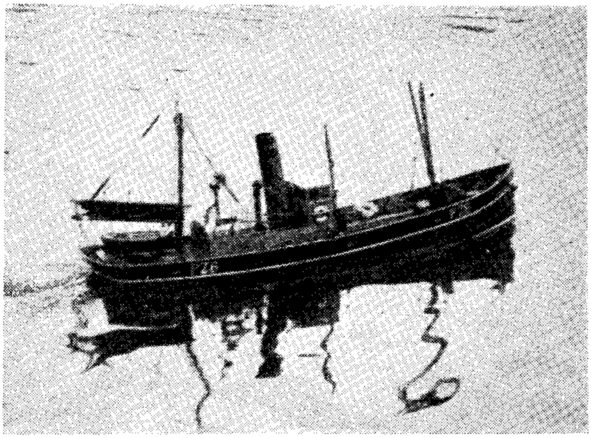
As to the relative merits of slide- and piston-valves for this engine, I am inclined to favour the former if the duty is light or moderate, using fairly low-pressure saturated steam. The flat valve, being self-seating, is capable of acting as a relief valve if the cylinders become water-locked —quite a common eventuality when simple pot boilers are used—and it is also very easy to set correctly. Piston-valves demand very careful fitting if they are to be reasonably steam-tight in so small a size, but they work with much less friction when hot, high-pressure steam is used.

In any small engines, accuracy of workmanship pays good dividends, and the present case is no exception to this rule; it is well worth while to take the same care in fitting the pistons and other working parts as is necessary in small i.c. engines. Although the engine will run quite well in spite of minor piston and valve leakages, it is only by the utmost care in eliminating all losses that true efficiency and steam economy can be obtained.

(To be continued)

The West London Regatta

by K. R. H. Roberts



A "cruiser" from West London. Don Maclellan's "Caroline"

THE Round Pond in Kensington Gardens, if only it could speak would have many stories to tell, and what changes it has seen. From being the inspiration for writers of poetry and romance to receiving the attentions of German bombs, from the stately sailing yacht to the advent of the c.i. hydroplane, the Round Pond has itself remained the same.

The West London Model Power Boat Club, recently held a regatta under the auspices of the Model Power Boat Association, and were glad to welcome members from seven other clubs. Some of the older members said it was the best attendance they remember at the pondside. Blackheath, Croydon, Kingsmere, Malden, Orpington, Swindon and Victoria all had representatives.

The nomination event was first with 24 entries. The course of 85 yd. seemed rather long for some of the visitors and a cross breeze from the shore sent several boats on a cruise to the far side of the pond. The faster entries gave the stoppers some strenuous exercise.

Mr. A. Rayman's *Yvonne* from Blackheath won, with a percentage error of 3.8. Mr. W. J. Hood's *Truant* coming second with 4.8.

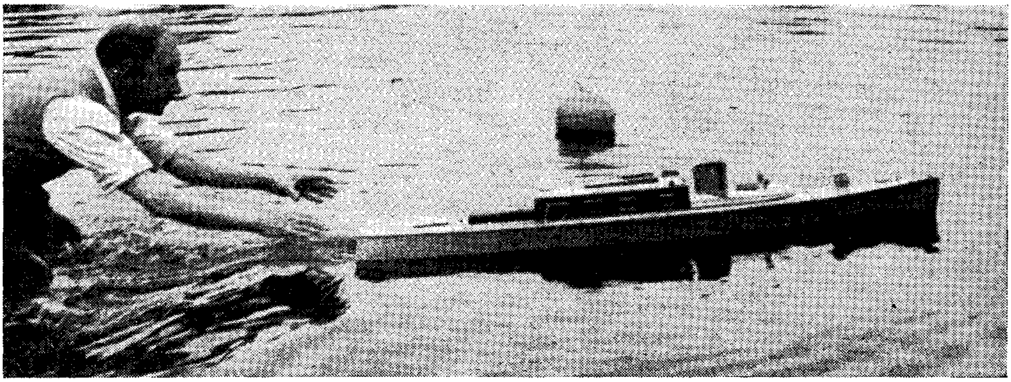
The steering competition followed, and, owing to the prevailing conditions, the scoring was very low. Mr. E. A. Walker of Croydon and Malden got an inner with his petrol boat *Corona*, 2 points, and it took the veteran *Leda III* piloted by the master hand of Mr. E. W. Vanner, from Victoria, to double this score and win.

The round-the-pond race was keenly contested, both entrants and their helpers having a good run for their money in every sense of the phrase. Although it is only half a mile, the going can be hectic and crammed with incident. Mr. Walker put up a good time with 8 min. 16 sec. and Mr. Curtis, of Kingsmere, was only 27 sec. behind him.

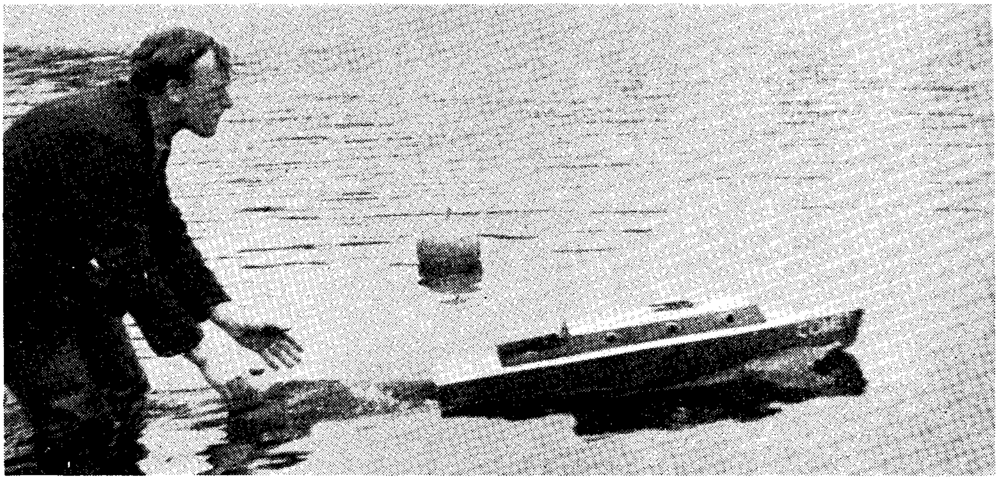
However, experience tells, especially when it dates back 25 years or more. The M.S.Y. *Mary Dean*, guided by her long-famous owner-builder, Mr. W. Butler, of West London, got round in 8 min. 15 sec.

The relay race was won by Mr. Walker's *Corona* and Mr. Fastier's, as yet, unnamed battleship from Kingsmere. A good team of contrasting types.

Percival Marshall & Co. Ltd., and Bassett-Lowke Ltd., of Northampton, each presented a



A fine study in concentration. W. J. Hood, of Swindon, starts "Truant" on the straight and narrow



"Steady Barker!" J. H. Benson releasing his fast steering boat

generous first and second prize for the nomination and steering events.

Apologies are due to the donors and prize winners that the awards were not on the spot but had to be sent on by post. The club's plea is heat waves and holidays for the tardy organisation.

A suggestion that the position of the course be altered to reduce the length of cruises taken by vessels possessed with a spirit of independence, was duly noted.

There was also the matter of flags on the bouys marking the Round-the-Pond race. Although having a diameter of some 10 in. and painted red, these were not easily seen in the poor light. More flags will be hung out in future.

The photographs illustrating this article were taken by Mr. R. Robinson.

Results :—

Nomination : 1st, A. Rayman, *Yvonne*, 3.8 per cent. error ; 2nd, W. J. Hood, *Truant*, 4.8 per cent. error.

Steering : 1st, E. W. Vanner, *Leda III*, 4 pts. 2nd, E. A. Walker, *Corona*, 2 pts.

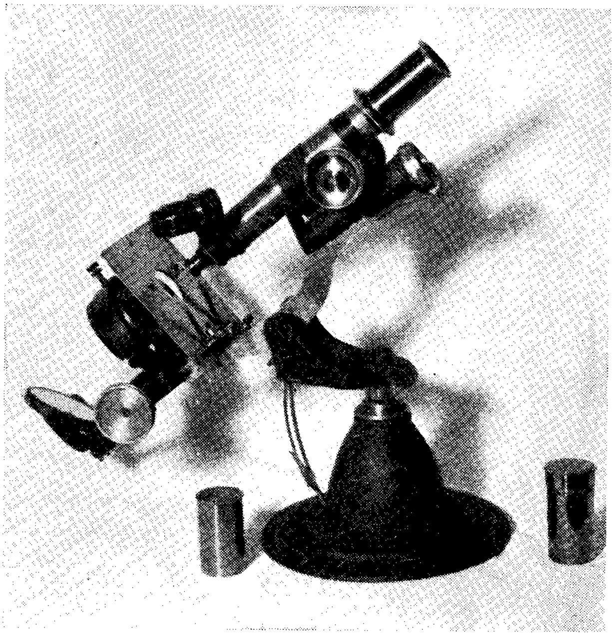
Round-the-Pond Race : 1st, W. Butler, *Mary Dean*, 8 min. 15 sec. ; 2nd, E. A. Walker, *Corona*, 8 min. 16 sec.

Relay Race : S. Fastier (battleship) ; E. A. Walker, *Corona*.

Surely the oldest team in model boating, and still going strong. Mr. E. W. Vanner gives the winning touch to "Leda III"

A Reconstructed Microscope

by A. Gilbert



The result of careful reconstruction—a useful microscope

SOME time ago I bought, quite cheaply, a second-hand microscope of very elementary form. I soon decided this would not fill all my requirements, and began to consider how best to make certain improvements in its construction.

To begin with I removed the small and somewhat insecure base, and fitted a new one made up of a plated disc from a motor car wheel, and a small metal electric light reflector. The latter was filled with lead, with a ¼-in. bolt through the centre to lock it to the motor disc, and also to the upper part of the microscope frame. This gives more height, and a greater gauge of manipulation, with a very firm base.

Fine Adjustment

Next, I made a new stage from a piece of sheet copper ⅛ in. thick and 4 in. square with a 1 in. hole drilled in a position to line up with the objective. This is bolted on to the main stem of the microscope by means of a small angle bracket, and is fitted with two polished steel springs to hold the slides. The original instrument possessed coarse adjustment only, so I proceeded to devise a fine adjustment, and this proved a very tedious operation, but I eventually succeeded by fixing an extra tube, which can be seen in the photograph, 2½ in. long. Within this tube is a length of fine threaded rod working on two small brass brackets (one each end of tube) which just engage with the main tube, and carry it up or down as the knurled knob at the top is turned. This allows for about $\frac{3}{16}$ in. traverse, which is ample.

I found a sub-stage condenser was also necessary, and, having purchased one, I mounted it in a ring cut from an old shade ring from an incandescent gas burner. This fitting already contained three adjusting screws for centring the condenser, and has proved very satisfactory. This brass ring was securely bolted on to the slide of a rack and pinion movement (government surplus, 4s. 6d.) and the rack and pinion was then cut down to the size required and bolted to the end of the main stem, thus providing an adjustable extension. A piece of round brass rod was then fixed to the end of this extension to carry the mirror (also government surplus) mounted in a home-made gimbal made from strip brass. The chief trouble with all this work was final alignment which must, of course, be accurate. Patience and careful work overcame this difficulty, however, and the results are very satisfactory.

A further refinement is the duplex nosepiece, which enables a change of objectives to be made without perpetually unscrewing them. The portions of the completed instrument not lacquered were then given a good coat of white undercoating, and finally treated with a coat of dull black chalk-board paint. The final result was totally unexpected, but nevertheless very pleasing. As the dull black dried, so a fine lined pattern was traced in it by the white paint beneath, giving a very good imitation of "Crackle" finish.

This job took quite a lot of time and careful work, but the final result is a microscope of considerable usefulness, which gives many hours of pleasure and instruction, besides saving many pounds in the cost of such an instrument.

PRACTICAL LETTERS

Model Speed Boat Performance

DEAR SIR,—I was very interested to read Geo. Stone's article on the Swiss Regatta, but he raises a number of controversial points to which I feel I must reply. For one thing he does not give any reason for stating that Victoria Park pond is unsuitable for high speeds, presumably because the waves made by the boat are not cancelled out but rebound from the side of the pond and cause quite an appreciable disturbance on the surface. Obviously it is desirable to have dead smooth water for the highest speeds (as Mr. Campbell found when waiting for this condition on Coniston Water, it rarely happens), but I should like to point out to Mr. Stone that we *have* got ponds or stretches of water in this country where ideal conditions can be found, but in regattas this year I have not noticed Mr. Stone's name figuring in the prize list, even when the regatta has been held on one of the ponds which would suit his boat.

He states that our regattas cannot compare with the speed event at Geneva. Of course they don't! We don't hold International meetings every Sunday during the summer. As for the "drawn-out straight-running events," may I point out that the time occupied in running off the nomination and steering events at the Grand Regatta, in which 60 boats took part in each event, was less than half the time taken by the speed events, in which 30 boats competed, and as we have a great number of interested spectators at M.P.B.A. regattas the straight-running events keep their interest alive with never a dull moment, as a constant procession of boats makes a valiant attempt to hit the target.

One other point. The speed for "A" class boats in the Grand Regatta and the Swiss event was almost identical. Why? if Victoria Park is so unsuitable

Finally, may I offer Mr. Stone my heartiest congratulations on putting up a new European record and in winning the 10-c.c. class event at Geneva?

Yours faithfully,
F. CURTIS.
London, S.W.18. Kingsmere M.P.B.C.

Machine Tools at the "M.E." Exhibition

DEAR SIR,—In the September 22nd issue of your valued paper rather severe criticism was made of our member Mr. T. Spike's hacksaw machine, which was exhibited at the recent London exhibition.

Whilst appreciating remarks regarding the rigidity of the saw carriage and its mounting on this type of machine, I think you will agree that "the proof of the pudding is in the eating."

At an exhibition organised by my society in 1947, this machine ran for ten hours per day for ten days, it was used to cut $\frac{1}{8}$ in. pieces from a 1 in. square mild-steel bar. During the whole time it showed no signs of breaking down or any other weakness. The cuts it made were accurate, and so quickly did it use up the available bar that eventually we had to use a blunt blade in order to carry on the demonstration.

The machine has been in use in Mr. Spike's workshop ever since, and as he specialises in making models from mild-steel sections, I can assure you it has had considerable use, and no signs of wear are apparent.

Whilst we all appreciate constructive criticism, I think your contributor's remarks in this case are somewhat unfounded.

Yours faithfully,
LESLIE J. OLDRIDGE.
Exeter & Dist. M.E.S. Hon. Secretary.

Multi-cylinder Petrol Engines

DEAR SIR,—I would like to offer my thanks for the valuable lead THE MODEL ENGINEER is giving the i.c. enthusiasts in the direction of popular types of multi-cylinder petrol engines.

They are very welcome and a timely change from the screaming "do-or-bust" two-strokes, but don't think for a moment that I am against the two-stroke. I feel that as a source of potted power ("quart in a pint pot," etc.) they are very useful, but being simply a functional power unit, no more—no less, they lack the obvious appeal of an engine that not only looks like a full-size one, but behaves and sounds like one, too. In referring to "popular" multi-cylinder engines, I used the word "popular" to make it clear that I referred to the "Seal" and "Seagull," etc., as I regard the "1831" and "Craftsman Twin" as specialised engines. Nevertheless, I hope the "1831" is the first of many water-cooled multies.

Perhaps one day we shall have a 6—or even a V8, who knows?

As a link, if one is needed between the 4-cylinder water-cooled type and the single two-stroke, how about bringing the little "Kinglet" to life again but this time as a "Kingfisher" vee-twin, air-cooled sidevalve, 10 c.c.?

An engine of limited appeal, maybe, but, after all, the cylinders, valves, etc., are already designed.

Lastly, although the "Seal" is wonderfully quiet, how about a few notes from Mr. Westbury's able pen on silencers, just to give us food for thought, and as far as I am concerned, experiment. Now that multi-cylinders are surely gaining ground, it would help ease the "hate" that we sometimes suffer when an engine gives tongue, and it would finish off the job in a manner in keeping with the character of the design.

The foregoing is not "hot air" on my part, as I'm hoping to have a shot at a "Seal Major" 30 c.c. shortly, for a radio-controlled passenger speedboat.

To close with—please keep up the good work on the multi-gauge types, especially water-cooled ones.

Yours faithfully,
Bickley. G. O. CAIRD.